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Contractors and Engineers Monthly

Vol. 46, No. 4 APRIL, 1949 $3 a Year, 50 Cents a Copy

Covering the Field

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- **Power-Plant Extended**
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- **Hot-Mix South and North**
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- **Big County—Big Road Job**
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- **Hungry Horse Dam**
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- **Sewer-Tunnel Construction**
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- **Concrete Resurfacing**
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- **New Mississippi Levee**
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- **Bridge Removes Bottleneck**
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C. & E. M. Photo

The Cedarapids asphalt plant which John Yerington set up for his 9-mile plant-mix surfacing job, reported on page 68, featured two driers, one on top of the other, to meet aggregate-drying specifications of the Michigan State Highway Department. At left in this photo is the metal hut which housed mineral filler for the mix.

Hartford Electric Light Co. Photo

The shell of a Drilled-In caisson, handled by a Lima crane, is positioned in a timber template prior to driving. Twenty-six of these caissons provide foundation support for the new extension to the South Meadow Station of the Hartford Electric Light Co., as described on page 5. Stone & Webster is building the extension.

C. & E. M. Photo

Take a look at wall pouring on Bressi & Bevanda's contract to extend the Los Angeles River flood-control channel 12,300 feet (see page 89). A Northwest 80-D picks up a 2-yard bucket filled from a MultiFoote paver and swings it over the heavy wall forms.

Contractors Hold 30th Convention

Construction Industry's Economic Aspects Are Discussed by AGC

+ ALL factors influencing the execution of the nation's 1949 construction program were thoroughly discussed at the 30th anniversary convention of the Associated General Contractors of America, held at the Waldorf-Astoria Hotel in New York City, February 28 through March 3. Emphasis was placed on the economic aspects of the construction industry, and particularly on holding costs to a minimum.

Over 1,200 delegates, including contractors and representatives of the 105 AGC chapters from all parts of the country, attended the meeting. The contractors' association represents more than 5,000 of the nation's leading general construction firms engaged either in building, highway and airport, or heavy-engineering construction.

New officers for 1949 were installed at the convention, after having been elected in a mail ballot prior to the meeting. The new AGC President is Adolph Teichert, Jr., President of A. Teichert & Son, Inc., a heavy-construction contractor of Sacramento, Calif. The new Vice President is Walter L. Couse of Walter L. Couse & Co., Detroit, Mich.—a firm primarily active in the building-construction field. Teichert succeeds Dwight W. Winkelman, President of D. W. Winkelman Co., a highway and airport contracting firm in Syracuse, N. Y.

President's Address

In his address, which opened the convention, Winkelman contrasted the $5,000,000,000 volume of new construction in 1918, the year the association was founded, with the $17,700,000,000 total attained in 1948. He revealed that the Government has called upon the association to help plan effective mobilization of the industry in the face of a possible World War III, adding that the construction industry completed, on time, work valued at more than $49,000,000,000 for World War II.

Winkelman said that he felt the trend towards big government will continue, and greater control of our economic life will be exercised by the Federal government. He called for a corresponding increase in the size and strength of the AGC, and adequate representation in the nation's capital to see that contractors' requirements are given "proper consideration by the Government agencies planning new regulations".

"One of the paradoxes of our times is that we now feel it necessary to defend more vigorously than ever before a way of life here which has made this a great nation and the envy of the world," declared Winkelman.

(Continued on page 82)

Morrison-Knudsen Co., Inc. Photo
At the San Francisco Airport, a Caterpillar-mounted spreader box places granular sub-base material for a new runway. Morrison-Knudsen holds the enlargement contract.

Morrison-Knudsen Co., Inc. Photo
Hot-mix for runway paving is fed to an Adnun Black Top Paver by an International batch truck. Brisbane Rock Co. is supplying the material from its plant 8 miles away.

Sky Birds to Roost On Hot-Mix Paving

San Francisco Airport Enlargement Calls for New Runways, Taxiways, And Important Drainage

By RAYMOND P. DAY,
Western Editor

✦ WHEN the latest multimillion-dollar construction job was let at the San Francisco Municipal Airport in the fall of 1948, one of the engineers said, "This one ought to be easy, because the hard part is over." It hardly turned out that way, for the start of the project was dogged by rains, beset by mud, and slowed by the enormous variety of work.

The latest $3,993,245 contract at this vast 3,600-acre air terminal includes paving, drainage, water supply, sewage disposal, and electrical and related work for the San Francisco City Public Utilities Commission. Morrison-Knudsen Co., Inc., of Boise, Idaho, has the job, and the company's San Francisco Highway Division office pushed right ahead to get as much work as possible finished before the winter rains.

The job is a general enlargement of the big municipal air terminal on land which was reclaimed. The reclaiming involved some 11,000,000 cubic yards of fill; of this, 6,000,000 yards was placed under contract by Morrison-Knudsen Co., Inc., and the Macco Corp. (see C. & E. M., March, 1947, pg. 60) and 5,000,000 was subsequently awarded to Guy F. Atkinson Co. It is a cut-up project: For example, there are 53 bid items on drainage pipe alone, which totals some 76,000 linear feet and requires nearly 130,000 cubic yards of excavation, including structures.

Paving consists of 3-inch asphaltic concrete, made with aggregates and 120 to 150-penetration asphaltic cement, and laid on a granular crushed-aggregate sub-base. The paving will provide a new 6,000 x 200-foot NE-SW runway, a new NW-SE runway of the same dimension (an existing taxiway will be rehabilitated to form this runway), and three long taxiways 75 feet wide. Two entrance roads to the field, an itinerant-plane parking area, and an automobile parking area are also included under the paving contract.

The contract was awarded October 4, and Morrison-Knudsen men and equipment started at once. There was a 75-day completion tag attached to the new runway, the entrance road, and a small part of one taxiway, with 450 calendar days allowed for the whole job.

Excavation Equipment Moves In

When the airport fill was brought in two years ago and laid down on the mud of San Francisco Bay, it was placed about 1 to 2 feet high to allow the proper settlement to take place. The fill settled generally about 12 inches, leaving a foot of excess dirt to be removed and disposed of near the runway and taxiway shoulders, to blend in with the general drainage pattern. This involved no more than a 1,000-foot haul, the free-haul figure for the job.

The excavation fleet is built around tractor-scraper equipment, with draglines and trucks rounding it out. The tractor fleet consists of 14 Caterpillar D8's and 6 new Allis-Chalmers HD-19's. Eleven LeTourneau Carryalls and Wooldridge scrapers are on the job, four of them behind the Allis-Chalmers tractors. The rest of the tractors are used either as pushers, as dozers, or as pullers for four sets of sheepsfoot rollers.

Draglines include six Northwests: a Model 41, 2 Model 6's, and 3 Model 25's. Hauling equipment under these machines consists of 20 new company-owned International KB-8 dump trucks. Up to 32 other rented trucks are on hand, chiefly for the crushed-base haul. A Northwest 80-D shovel loads out borrow material from a hill near Millbrae, where the fill material is available.

This excavation equipment worked 8 hours a day, 5 days a week, last fall, without trouble aside from routine operating problems. As the initial areas were graded and made ready for the flexible-base material, the work gradually enlarged.

Several new types of rollers are being used on the job. A Porter 100-ton Super-Compactor is available for deep compaction in the subgrade, and for pre-stressing the crushed-aggregate sub-base. Incidentally, the presence of mud underneath the fill caused this roller to turn up a few soft places which had to be dug out and re-filled with better material.

A Cedarapids vibratory compactor was also used on a demonstration basis for a short time, and then was moved. However, the bulk of routine compaction is done by sheepsfoot rollers.

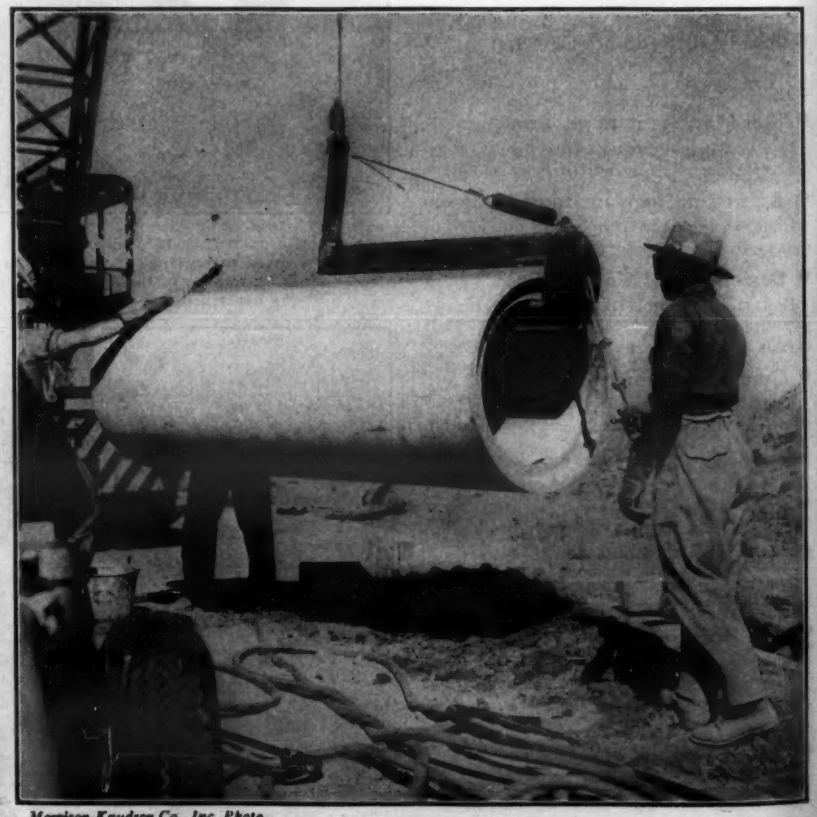
Strange as it seemed once rain began to fall, quite a bit of watering was necessary early in the job. Two Euclid 4,500-gallon tank wagons, a Euclid 3,500-gallon tank, and two International 3,000-gallon tank trucks saw service, hauling water out to the fills. Compaction to at least 95 per cent of modified AASHO density is required, so the moisture content is very important.

Ditching Is Big Job

The toughest job of all from almost

(*Continued on next page*)

Morrison-Knudsen Co., Inc. Photo
Enlargement of the San Francisco Airport calls for 76,000 linear feet of drainage pipe. Here a concrete section is spotted over its trench and lowered into place by a crane.



Morrison-Knudsen Co., Inc. Photo
As the crane lifts another section of drainage pipe, notice the special U-shaped hook it uses to place pipe sections horizontally and hold them until they're joined.

every standpoint is the ditching. Since the present fill was dumped in on top of the mud of San Francisco Bay, part of the field will be under the high-tide level permanently and will require the use of dewatering pumps. The fill was dumped in such a way that a great wave of mud was forced out ahead, but the material underneath the airport is not exactly what engineers or construction men like to work in when they lay pipe.

When draglines and ditchers dig down to the level of the various pipes, they find ground water and heavy mud. It is impossible to open up very much trench ahead of the pipe-layers because it would cave in. And the ditches have to be dug oversize in most cases to insure enough bottom width for the pipe sections.

Trenching equipment consists, wherever possible, of 2 Buckeye and 2 Cleveland trenching machines. In some of the bad mud the draglines are pressed into service. As rapidly as the trenches are opened up, surveyors establish grades and the pipe sections are laid. Clay, concrete, and corrugated-metal pipe is used, as well as thousands of feet of electrical duct.

A Caterpillar tractor with a side boom is laying most of the pipe, but when this machine was not available early in the job a Northwest machine did the work. A special crane hook was used to great advantage to pick up the pipe sections, to place them horizontally, and to hold them until the section was joined. It consisted of a long U-shaped steel section with a lifting arm on the upper side.

Many of the places where the mud oozes in have to be treated individually, of course, by undercutting the mud and dewatering. A good firm grade is established in all cases, and backfill is placed and rolled after the pipe is covered.

Most of the trenches underlie the crushed-rock base and paving, so the rapid completion of this part of the work is really one of the important keys of the job.

Crushed Aggregate Base

Specifications call for a crushed-aggregate sub-base under runways and taxiways. The course is 15 inches thick under taxiways and 12 inches thick under the runway paving. This rock sub-base also extends out 8 feet on each side beyond the runway limits, and 5 feet beyond the taxiway sides. This portion will be built up later with more crushed rock to provide a uniform slope.

Arrangements for the purchase of this crushed material were made with the Brisbane Rock Co., whose quarry is about 8 miles from the job. Produced commercially at Brisbane, the material is first mixed through a pugmill at the plant, where the water content is applied. International trucks then haul it out to the airport, and it is laid down.

"We like to get from 1,000 to 1,500 feet lined out ahead if possible," said General Superintendent George Haensel, "but sometimes it's simply a matter of taking what grade we have ready."

The trucks dump their loads into a spreader box mounted on the front of a tractor, which spreads the material evenly in lifts not over 4 inches deep. No processing is necessary because the material has already been mixed through the pugmill. Nine 3-wheel 10-ton steel rollers are assigned to this job to roll the sub-base down to 95 per cent density. The top lift is also rolled by the heavy Porter Super-Compactor.

The surface of the sub-base, when completed, is sealed or primed with 0.3 gallon per square yard of MC-1 cutback asphalt. This is applied by an Etnyre distributor owned by the oil company which is furnishing asphalt for the job.

Asphaltic-Concrete Paving

All asphaltic concrete is furnished to the job by the Brisbane Rock Co. This commercial producer has a Standard 3,000-pound asphalt plant set up at the Brisbane rock deposit, and supplies hot-mix to a large local area.

Morrison-Knudsen Co., Inc. Photo

Personnel on the San Francisco Airport job are: left to right, seated, Master Mechanic Blanchard, Engineer Richards, and Project Manager Gregg. Standing, General Superintendent Haensel; Foremen George Coons, Jack McGuire, and Tex Smith; and Pipe Superintendent Kenneth Fuquay.

The San Francisco Airport mix contains 5 per cent of 120 to 150-penetration asphaltic cement. After being proportioned and mixed through the pugmill, the material is hauled out to the job in 9-ton loads by a fleet of 12 rented trucks.

An Adnun Black Top Paver lays the material. In order to come out evenly, 12-foot strips are usually laid, and the machine is narrowed for the last pass. Some of the intersections call for so much hand raking that a crew of about six men is necessary, but when the machine operates on the straightaways, half that many men is enough.

The first strip is, of course, laid to a string line, and succeeding strips are referred to the one previously laid. The hot-mix goes down in two 1½-inch compacted layers, with an allowance of about 1¾ inches per course to compensate for compaction. A Buffalo-Spring-

(*Concluded on page 94*)

University of Texas enlarges its stadium

Access streets, parking areas, sidewalks, area under stands are paved with Texaco Asphaltic Concrete

The enlarged stadium of the University of Texas. Photo taken during the game with Louisiana State University. General contractor was R. P. Farnsworth Company, Inc., of Houston. Texaco Asphalt paving was laid by Collins Construction Company, Austin.

Laying 2-inch Texaco Asphaltic Concrete paving on one of the streets leading to the stadium.

Under the stands, the 1½-inch asphalt surface was laid on a crushed stone base.

A Texaco Asphaltic Concrete sidewalk 15 to 20 feet wide was laid around most of the stadium.

The University of Texas has increased the seating capacity of its stadium from 46,000 to 66,000 at a cost of $1,400,000.

An interesting feature of this noteworthy project is the variety of service which resilient, joint-free Texaco Asphalt paving is called upon to perform. In addition to several streets leading to the stadium, Texaco Asphaltic Concrete paving of the hot-mix, hot-laid type was laid on sidewalks and parking areas, as well as the area underneath the seats. A 2-inch asphalt surface was specified for the streets, while 1½-inches was considered adequate elsewhere.

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Contractors and Engineers Monthly

A NATIONAL BUSINESS PAPER
For the Highway and Heavy-Construction Industry

Issued Monthly by Buttenheim-Dix Publishing Corp.
Editorial and Business Office: 470 Fourth Ave., New York 16, N. Y.

Acceptance under the Act of June 5, 1934, at Mount Morris, Illinois, authorized March 26, 1945.

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BRANCH BUSINESS OFFICES
Daily News Bldg., Chicago 6, Ill. — Duncan A. Scott & Co., Mills Bldg., San Francisco 4, Calif. — 2239 Ben Lomond Drive, Los Angeles 27, Calif.

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One Way to Stretch Cement

Another construction season is here, and it seems likely to repeat 1948's construction problems on an accelerated scale. High in this list of problems is materials. One of the big if's of the future is certain to be cement.

Cement is still in short supply in many localities. Some users say it is getting shorter. Some attribute the curtailment of distribution to the uncertainty of interpreting correctly the court decision on the abandonment of the basing-point system. At least a part of the answer to the problem is ironic, for the development of the several improved types of cement in recent years is now acting to cut down plant production. One big plant which makes twelve grades of cement is "out" of the stuff with 80,000 barrels in its storage silos, a victim of overproduction of types.

Storage bins, sampled and passed by inspectors, cannot be contaminated by another batch until the silo is empty. Sometimes this storage space is desperately needed, so the ball mills and kilns can keep running. Plant production suffers while the contents of half-empty storage silos wait to be hauled away. And the shortage of steel prevents the hauling fleets from being enlarged.

It is obvious that two or more types of cement cannot be mixed in storage. High-early, regular portland, low-alkali, and the other types all present individual storage problems detrimental to plant production as a whole. Finer grinds in certain cements slow down the ball mills and put a brake on output. Production, profit, and performance suffer.

Since many cement plants were designed primarily for the production of as few types of cement as possible, and perform at optimum capacity while making one kind, a rather common-sense answer suggests itself. Why not make that one kind of cement, and boost plant output?

Why not, indeed?

Unfortunately, it calls for certain concessions on the part of cement users, whose demands gave rise to some of the types. A dam builder wants low-alkali cement because the designer insists on its use. A house contractor, anxious to begin carpenter work, uses high-early in the foundation so that the concrete will be as strong in 24 hours as it would ordinarily be in seven days. A waterfront contractor needs it for a tremie job. Highway departments in some states also draw up their own cement specifications, compelling manufacturers to turn out a specialized type for highway use only. Designers, purchasing agents, and editors take a hand in the matter. And so it goes.

The plain truth of the matter is that many a concrete job poured with the newer cements could have been put in just as well with the regular portland or gray cement, saving the strain on the cement mills. Numerous concrete structures many decades old are still in good condition throughout the country; there are also examples of later concrete construction that have shown deterioration. The answer does not lie in cement technology as such.

Rather, the answer seems to lie in an intelligent compromise; to turn as much plant production as possible back to the manufacture of regular low-priced portland cement.

Pacific Gas & Electric Co. of central California recently undertook the enlargement of its vast hydroelectric works. Its designers chose regular portland cement, after toying with other ideas. With close to $100,000,000 of private capital at stake, PG&E chose to shave costs, to insure dependable cement deliveries, and to construct vitally needed works. Those dams and tunnels will have to stand the test of time as long as any other dams and tunnels—government or otherwise—in that locality.

We believe that PG&E is right—perhaps more right than its engineers themselves know. It is the *users* of cement who can boost plant output by specifying the regular kind wherever possible. There will always be some special jobs where special cement is needed, of course. But the more our cement plants can be made to manufacture one kind of material, the greater will be their output and the less acute will be the cement shortage.

Increase in Federal Aid To $1,000,000,000 Is Urged

An increase in Federal-Aid authorizations to $1,000,000,000 annually is urged by Charles M. Upham, Engineer-Director of the American Road Builders' Association. Mr. Upham pointed out this need at the 36th annual meeting of the Wisconsin Road Builders Association. The amount would be double the highest previous figure set under the Federal-Aid Act of 1944.

Mr. Upham deplored a feast-and-famine road-building psychology with its lack of planning. "By the time the [road-construction] situation becomes critical", he said, "it is too late to meet demands with a normal program, so . . . [the work] is pushed to a level too high to maintain indefinitely and then reduced to a correspondingly low level." This feast-and-famine psychology results in a series of starts and stops in highway construction.

He pointed out that a total of $3,000,000,000 in new construction and $1,000,000,000 in maintenance is needed annually to get our highways in shape to handle present and future traffic. According to Mr. Upham, the proposed authorization with matching funds, and added construction expenditure at state and local levels, would approximate the total amount required.

Fred I. Rowe, Chairman of the AGC Membership Committee, presents the Cashman Trophy for membership promotion to Vice President N. K. Dickerson, Jr., (left) and Manager Robert Patten of the Carolina's branch.

SNAPSHOTS FROM THE AGC CONVENTION

Professor Sumner H. Slichter (left) of Harvard University, speaker at the AGC Convention, is greeted by Dwight W. Winkelman, 1948 President of the AGC.

Rear Admiral J. J. Manning (center) was a featured speaker at the AGC convention luncheon. To right and left of him are, respectively, Kirby Smith of Raymond Concrete Pile Co., Chairman of the Executive Committee of the ASCE Construction Division, and A. S. Horner of A. S. Horner Construction Co., Denver, 1949 Chairman of the AGC Heavy Construction and Railroad Contractors' Division.

R. E. Dougherty (left), Past President of the ASCE, addressed the AGC luncheon on the relations between contractors and engineers. Thomas H. MacDonald (center), Commissioner, Public Roads Administration, reviewed the current highway program. George C. Koss of Koss Construction Co., Des Moines, Iowa, and Chairman of the AGC Highway Contractors' Division, is on MacDonald's left.

Extension Increases Power-Plant Capacity

Drilled-In Caissons Form Foundation for Addition To Steam Station; Shells Are Driven Into Bedrock

By WILLIAM H. QUIRK,
Eastern Editor

(*Photo on page 1*)

✦ AN extension to the South Meadow Station of the Hartford Electric Light Co., now under construction, will increase the station capacity to a total of 230,000 kilowatts, largest in New England outside of Boston. The addition is a five to eight-story structure of concrete, steel, and brick, on the south side of the station. When it is completed early in 1950, it will house a new 45,000-kw turbine-generator with boiler and all auxiliary equipment. The big Hartford, Conn., South Meadow Station, located on the west bank of the Connecticut River, is the main production steam plant of the utility company.

The new extension increases the length of the station by 70 feet, to make it 440 feet long. The width of 124 feet corresponds to the existing width of the plant. The addition consists of a boiler room on the east side, measuring 70 x 70 feet, and a turbine room adjoining it on the west side. Because of a jog in the existing building, the turbine room is longer; it is 85 feet in length and 54 feet wide. The design also calls for building an electrical wing or bay, 33 feet x 24 feet 6 inches, off the northwest corner of the extension, and a switchgear house along the south side of the new structure.

Stone & Webster Engineering Corp., of Boston, Mass., is designing and constructing the extension which is estimated to cost $7,300,000. Work on the project began in May, 1948. After the preliminary excavation, steel shells were driven for the 26 Drilled-In caissons which form the foundation of the structure.

Solid Foundation Required

For heavy construction like a power plant, the most solid of foundations is required. When the original building of the South Meadow Station was built back in 1920-1921, the foundation consisted of concrete piles driven into a stratum of sand overlying a deep bed of clay. Settlement occurred as the clay consolidated under the load. The first extension, added to the plant in 1927, was for a mercury turbine involving much heavier loads per unit of area than the initial station. Consequently greater settlements were to be expected if the same type of foundation was installed, and it was decided to use pneumatic caissons carried to bedrock.

Again, ten years later, when a second addition was constructed, 5½ to 6-foot-diameter caissons were put down to bedrock by the Powell or mud-slurry method. In 1942 for a third extension, Drilled-In caissons were used. The 1948-1949 construction employs a similar type of foundation.

Drilled-In caissons are a patented process designed to provide the maximum foundation support at minimum cost combined with great speed in construction. For this foundation, they consist of open-end 30-inch-diameter spiral-welded steel cylinders which are driven to bedrock. After the shells are excavated and the socket into rock is drilled, steel H-beam cores are placed and centered inside, resting on and in bedrock. The steel H-beam is then encased in concrete.

In the 1942 work, one of the caissons was designed to carry a load of 1,356 tons, while in the present construction the greatest single caisson load is 1,702 tons which is transferred to bedrock through the component parts of the caisson. The Drilled-In Caisson Corp. of New York City constructed this particular type of foundation under a subcontract.

Excavation

In turn, another subcontract for site excavation was handled by E. B. McGurk, Inc., of Hartford. For the primary phase of his work, this contractor used a ¾-yard backhoe to excavate from an average ground elevation of 30.0 down to plus 12.5 at the western or turbine-room end of the project. This level of excavation extended over approximately three-quarters of the site, and

(*Continued on next page*)

Hartford Electric Light Co. Photo

The white outline on this photo indicates the shape and position of the extension to the South Meadow Station of the Hartford Electric Light Co., which will be completed early in 1950. Stone & Webster Engineering Corp. of Boston is designing and constructing the extension which will cost about $7,300,000.

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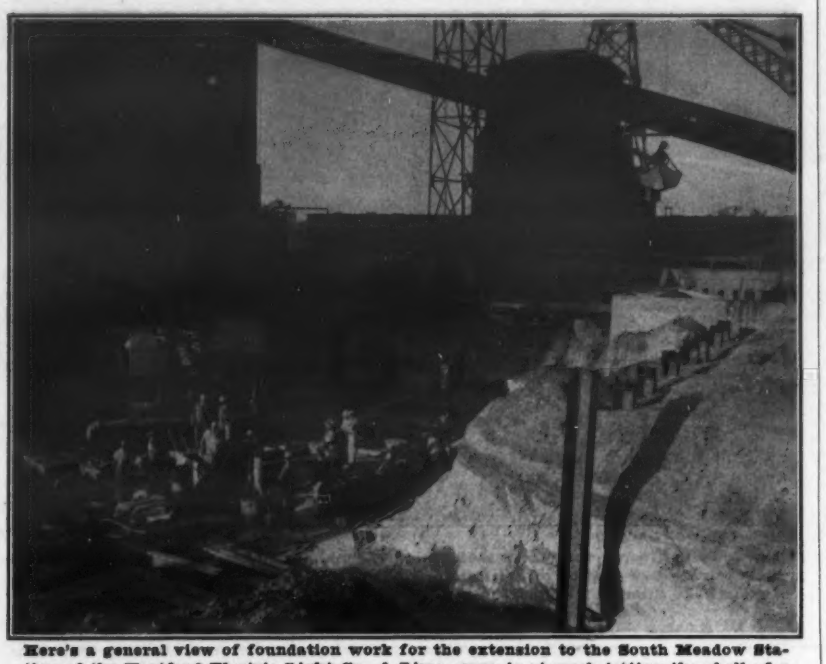

Here's a general view of foundation work for the extension to the South Meadow Station of the Hartford Electric Light Co. A Lima crane is at work jetting the shell of a Drilled-In caisson before it receives its steel core.

Extension Increases Power-Plant Capacity

(*Continued from preceding page*)

was taken out in two lifts. The remaining and shallower portion of the hole for the boiler-room foundation went down only to a working elevation of plus 25.0. A work road was ramped down into the hole from the south end of the cut. Trucks hauled the material out and spoiled it over low ground within the plant area.

On these two working levels timber templates were laid out on centers of caisson location to receive the caisson shells for driving. They consisted of 12 x 12's framed and set flush with the surface of the ground to leave an inside opening 34 inches square. Angle-iron guides took up the intervening space between the outside of the shells and the cribs. The templates held the caissons true to line during the driving.

Driving from these comparatively high working levels eliminated any trouble from ground water that could naturally have been expected if the excavation had been deeper. At these shallow depths, pumping was negligible, and no sheeting was required as the complete excavation was dug back with natural 1½ to 1 slopes.

Steel Cylindrical Shells

The 30-inch caisson shells, with ½-inch walls, are made from hot-rolled spiral-welded steel, and came in 70-foot lengths weighing 5½ tons each. A specially tempered tool-steel cutting edge with an internal 45-degree chamfer was welded to the bottom of the first section driven; this increased the diameter of the pipe to 32 inches for the lower 2 feet. The cutting edge protected the shell from damage during the driving, and provided a base for seating it in bedrock. External splice collars were welded to the top of the lower cylinder for attaching the second section of shell.

Because of the design of the structure, peculiar to a power plant, the caisson layout conforms to no even pattern. While all 26 caissons were driven to bedrock at about minus-91 elevation, the cut-off or top elevation varies from plus

(*Continued on next page*)

C. & E. M. and Hartford Electric Light Co. Photos

With jetting completed, Bucyrus-Erie 28-L drill rigs bailed the mud and water from the shell, using bailing buckets or sand pumps 15 feet long x 20 inches in diameter.

The interior of the caisson shell and the rock socket were then visually inspected by lowering an engineer within a cage down into the shell. Here, an inspector who has just come back up in his cage is reporting to a recorder.

When the muck was cleaned out, each Bucyrus-Erie rig drilled a socket in bedrock to seat the cutting edge of the caisson shell. A star-type drill bit was used.

In addition to the caisson work, this row of steel H-beam bearing piles was driven to rock, west of the main extension, to support outdoor transformer banks.

4.0 under the turbine room to plus 13.0 and plus 25.0 under the boiler room. Consequently the caisson shells are from 95 to 125 feet in length.

Driving of the shells started on June 24 and concluded on August 6. The sections were picked up by a P&H 255A truck-mounted service crane and spotted within reach of the 90-foot steel leads, which were supported by a Lima Model 802 crane equipped with a 60-foot boom. The shells were carefully centered over the templates, and plumbed both ways with transits prior to driving. A Vulcan No. 0 hammer with a 7,500-pound ram and a 40-inch stroke drove the shells. It had a specially built head to prevent damage to the cylinders during the driving.

Driving and Excavating

To reach bedrock, the caisson shells were driven through an overburden consisting first of about 12 feet of silt, then around 30 feet of sand, and finally red-brown clay for the rest of the distance to rock. Driving through the silt and sand was slow, but the speed increased when the soft clay was reached. Through this stratum the caissons penetrated about ½ inch per blow. During the driving the caissons were constantly checked for alignment and plumbness.

As the first section reached ground level, an additional length was placed on top. The two sections were then welded together at the splice collars or external sleeves, and the driving continued.

If penetration had become difficult, driving would have been suspended and the shells excavated. In all cases on this job, however, the interiors of the caisson shells were not mucked out until they were driven to the rock. Mucking was done with a 90-foot length of 3-inch jet pipe, with a 1-inch nozzle at the bottom which was lowered into the shell. This shot out a stream of water at 1,000 gpm under a pressure of 250 psi. Loose material was floated up out of the caisson and spilled on the ground. The water was trenched to a sump and pumped away from the site.

Drilling

When the jetting was completed, one of two skid-mounted Bucyrus-Erie 28-L oil-field-type drill rigs powered by 85-hp gasoline engines was moved into position over the caisson. The 60-foot masts on these rigs had been cut down to 30 feet, since the extra length was not required on this job. The drill rig bailed the mud and water from the shell, using a bailing bucket or sand pump 15 feet long x 20 inches in diameter, equipped with a flapper valve on the bottom and a piston within the pipe. As the piston was drawn up through the pump, material entered through the bottom valve. The loaded pump was then brought to the surface and emptied. When the muck was cleaned out, a socket was drilled into the bedrock, varying in depth from 4 feet to 10 feet 10 inches, according to the load on the different caissons.

The drill bit used was the star type. It was 5 feet long and weighed 2 tons. Its 28-inch diameter just fit within the caisson shell which has an inside diameter of 29 inches. The drill was worked up and down inside the shell with a 40-inch stroke and a turning motion accomplished by using a swivel joint like those employed in oil drilling. Its concussion-like action pulverized the material within the shell.

During the drilling the caisson was kept filled with water. The shells were also re-driven to the depth required in order to seat the driving or cutting edge in solid unfissured bedrock. This not only prevented any material from getting into the caissons around the bottom of the shells, but also usually sealed off the ground water which had an approximate head of 100 ft. In this way the caissons could be completed in the dry after the water had been bailed or pumped out.

The interiors of the caisson shells and the rock sockets were then visually inspected by lowering an engineer within a cage down into the shell. He reported on its plumbness or any displacement from the vertical, curvature or out of round, and the amount of water leakage into the caisson.

If the flow of water into the rock socket exceeded ½ inch per minute, a 1:1 tremie grout was placed in the socket. The top of the caisson was sealed, and compressed air or water under pressure was then admitted into the shell, thus forcing the grout into the cracks and crevices of the rock. When the grout had hardened, the socket was re-drilled and the material cleaned out. The grouting and re-drilling was repeated for certain caissons where the flow of water was still above the allowable rate.

Steel Cores

Three of the caissons which are to

(Continued on next page)

Hartford Electric Light Co. Photo

The Lima rig at left has just finished driving a caisson shell for the power-plant extension in Hartford, Conn. The two drill rigs are drilling sockets into rock to seat the cutting edges of the shells.

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Extension Increases Power-Plant Capacity

(*Continued from preceding page*)

support loads up to 495 tons each do not contain cores of structural rolled sections. However, reinforcing was provided for the sockets of these caissons by means of 23-inch-diameter spiral cages welded to vertical reinforcing bars. The cages extended approximately 6 feet upwards from sockets into the caissons in order to provide a fixed connection between the bedrock and the caisson.

The remaining 23 caissons contain steel cores of 14-inch steel H-beams, some with added cover plates, weighing from 89 up to 570 pounds per foot. The caisson with the heaviest load of 1,702 tons contains a 14-inch 398-pound section and is further reinforced with two 16-1/8 x 2-1/16-inch steel plates. This particular caisson is also the heaviest, weighing 65 tons complete, and has the deepest rock socket of 10 feet 10 inches. It is 120 feet long.

Before lowering the cores into the shell, the socket and caisson were filled with a mixture of 1:1½ cement-sand grout to a point 4 feet above the cutting edge. The steel was immediately lowered into the grouted socket. The rest of the caisson was then filled with concrete designed for a strength of 4,000 psi. Concrete was supplied to the job in truck-mixers by the Edward Balf Co. of Hartford. The ready-mixed concrete was chuted or bucketed into the caissons in a continuous pour.

The total estimated weight of the 26 caissons is 1,500 tons. They are designed to support an estimated load of 20,000 tons which includes the substructure, superstructure, equipment, and half the live load of the power-station extension. This is possible because the Drilled-In caisson, being definitely fixed in a socket at the bottom, is designed as a fixed-end column. Its allowable end bearing is 1,400 psi as compared with the 700 psi of a standard caisson designed as a simple column. Furthermore, with the Drilled-In caissons, 200 psi is allowable for bond between the concrete and the walls of the socket. The bond is also effective in resisting hydraulic uplift.

The allowable stresses in the component parts of the caisson, which transfer the imposed loads to bedrock, are as follows:

Steel shell	12,000 psi
Steel core	15,000 psi
Reinforcing rods	18,000 psi
Concrete	1,000 psi

Capping the Caissons

After the caissons were filled with concrete, the excavation of the site continued from the 12.5 elevation. The excavation around the caissons was handled by a ¾-cubic-yard clamshell bucket. At elevation 9.0 ground water was encountered, and a Moretrench wellpoint system was installed with its 8-inch header line encircling the hole at the 12.5 elevation. The Connecticut River is only about 200 feet from the edge of the site. With the water situation well in hand, the excavation went down to the required levels. The condenser pit, for instance, is at elevation 6.35, or about 24 feet below the surface of the ground.

When the excavation was completed, the remaining caissons were cut off at the design elevation using a cutting band to insure level burn-off. Then the top of the concrete was cleaned off in preparation for capping. Six shear rings with a 1-inch square cross section were welded to the outside of the caisson shells near the top. Their spacing, from the top down, is 7, 8, 8, 8, and 8 inches. Around the top of the caisson a heavily reinforced concrete cap was poured, encasing the shear rings. These caps are 3½ feet deep and from 5 to 5½ feet square. The caps support a network of heavily reinforced concrete girders. These girders average 5 feet in depth and 5½ feet in width, and in turn support the steel building columns. The caps and girders thus lock the caissons together. The caissons were completed in November, 1948.

C. & E. M. Photo

Andrew T. Bower (left) is Superintendent for Stone & Webster Engineering Corp. on the Hartford power-plant extension job, and Stephen Kusmik is Engineer for the Hartford Electric Light Co.

In addition to the caisson work, a row of steel H-beam bearing piles was driven to rock along the line of the switch-gear house south of the main extension. Another row of H bearing piles was driven to rock west of the main extension to support outdoor transformer banks. Designed for 65-ton loading, the piles consist of Carnegie-Illinois 14-inch 73-pound sections. They average 122 to 125 feet in length.

Concrete, Steel, and Brick Building

Like the existing power plant, the extension will have concrete outside foundation walls of varying thickness up to elevation 36.4. These water-tight walls were built originally for protection against floods. Dikes along the Connecticut River, completed in 1942, offer protection to elevation 44.0. The base-

(*Concluded on next page*)

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ment concrete floor slabs are 23 inches thick with an additional 3-inch finished-concrete topping in the boiler-room area; in the condenser-room area the 3 inches of finish includes a quarry-tile floor.

During the 1949 construction season, the Lehigh Structural Steel Co. of Allentown, Pa., will furnish and erect the structural steel totaling 1,000 tons. The turbine room will go up to elevation 100.0, and will have a 100-ton crane just under the roof, rolling along on rails. The General Electric 45,000-kw turbine-generator will be on the turbine-room floor at grade 37.0. A Westinghouse 36,000-square-foot condenser is underneath at floor grade 12.0.

A Babcock & Wilcox boiler, with 18,231 square feet of heating surface designed for 425,000 pounds of steam per hour, will be installed in the adjoining room which will have its boiler-room operating floor at elevation 53.0. The roof in this part of the extension goes up to elevation 156.0, and on top of that is a 12-foot-diameter steel stack 60 feet high. The new boiler is No. 8, since there are already seven boilers and a mercury boiler in the existing station.

Above the concrete foundation walls, the sides of the plant will be of common brick with a red paving-brick veneer to match the existing station. The brick walls will average 19 inches in thickness, and about 1,000,000 bricks will be required for the building. Other large construction items include 375 tons of reinforcing steel furnished by Bethlehem Steel Co., and 5,000 cubic yards of concrete. Plywood forms will be used for the 54,000 square feet of exposed concrete in the superstructure, while pine boards will suffice for the 55,000 square feet of concrete in the substructure. The extension contract also includes the construction of a screen intake house on the river bank outside the concrete dike wall.

Will Meet Power Demands

With this extension of its South Meadow Station, the Hartford Electric Light Co. has prepared to meet the unprecedented demands for electric service which began during the war and have continued ever since. When the new 45,000-kw unit is completed, the station will have a total capacity of 230,000 kw, consisting of two units at 20,000, one at 40,000, three at 45,000, and a mercury-vapor cycle at 15,000 kw. The latter unit is also being completely rebuilt at this time. In 1947 the company produced 1,018,102 thousand kilowatt-hours. This is about eight times the 1921 output, the year the first section of the original South Meadow plant was put in service.

Personnel

On the construction of the foundation for the plant extension, 70 men on an average were employed. During the 1949 season a maximum of about 350 workers will be required. Stone & Webster Engineering Corp., is represented on this project by Andrew T. Bower, Superintendent of Construction. The subcontract with the Drilled-In Caisson Corp. was directed in the field by William H. Geer, Superintendent, and Frederick Sofka, Job Engineer.

The Hartford Electric Light Co. is represented on the construction by Stephen Kusmik, Engineer. F. D. Knight is Vice President in charge of engineering, with C. L. Derrick, Superintendent of Engineering, and Dwight Douglass, Superintendent of Power.

Portable Chain Saw

A gasoline-driven chain saw is announced in a new model by the Mall Tool Co., 7738 S. Chicago Ave., Chicago 19, Ill. The lightweight Model 10 is for either one or two-man use and features a die-cast magnesium construction.

The saw chain can be set at any desired angle for felling or bucking operations. A round-nose bucking bar makes it possible to start a cut with the tip of the round end, the manufacturer points out, and to cut wood with a diameter twice the size of the bar's length by making cuts halfway through from each side. A detachable tailstock converts the saw for two-man use.

The engine throttle is operated from either a horizontal crossbar or from the right-side handle, whichever is more convenient. A float-type carburetor is said to feed enough fuel to the engine to keep it running on angle cuts.

Die-cast magnesium construction makes the Mall Model 10 gasoline-driven chain saw suitable for one as well as two-man operation.

The saw is available with 18, 23, 36, or 48-inch blades.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 70.

Diesel-Powered Graders

Diesel motor graders in building and maintenance operations are the subject of an 8-page 2-color catalog issued by the Caterpillar Tractor Co., Peoria 8, Ill. Form No. 11799 features the use of these graders on state, county, and township roads.

The folder tells how the Caterpillar graders handle all types of work, from heavy construction to fine maintenance. It describes the machine's blade action, the way it obtains traction where loose footing is encountered, its mechanical controls, its maneuverability, and the sizes in which it is made to meet specific needs.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 83.

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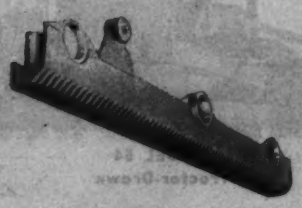

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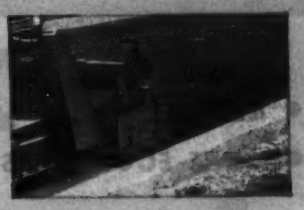

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To the basically correct principles of paver design long-proved in earlier model Jaeger pavers, the Model BP-5 adds many important improvements in automatic precision and adaptability to the varied materials and conditions encountered in road, street and airport work. For complete information, see your Jaeger distributor or send for Catalog BP-9, describing numerous advantages of interest to contractors and highway engineers. Early deliveries will be limited to orders already on hand.

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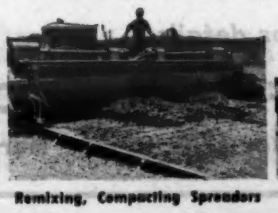

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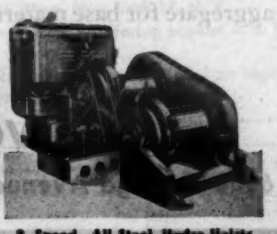

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New Bucket Handles Low-Slump Concrete

A concrete bucket for heavy-duty work on big dam projects is announced by the C. S. Johnson Co., a subsidiary of the Koehring Co., located at Champaign, Ill. It is designed to handle concrete of any stiffness, and is available in 2, 3, 4, and 8-cubic-yard sizes. According to the manufacturer, the Lo-Slump bucket has handled and dumped, without segregation, mixes with a cement content of 2 bags per cubic yard, and with slumps of ½ inch using a 6-inch aggregate.

The Lo-Slump bucket features an extra-large discharge opening and a fully controlled double-clam discharge gate. The gate can be operated manually or by compressed air. When operated by air, the gate closes automatically when the supply-hose valve is released or when the hose nozzle is pulled away from the air socket, the manufacturer points out.

The hinged bail link is designed to stand vertically and is slotted to give a large vertical hooking range. The center part of the bucket is unobstructed for easier filling. The bottom slopes above the cylindrical discharge section are set at approximately 68 degrees. The 42-inch-diameter center opening is said to prevent arching of the concrete. Segregation is prevented by the folding action of the concrete as it flows from the center of the bucket. The buckets are constructed of ⅜ and ¼-inch plate. The 6-foot-diameter 4-yard bucket has a weight of 4,000 pounds.

Designed especially for use on big dam projects, the Lo-Slump bucket handles mass concrete of any stiffness without segregation, says its manufacturer, the C. S. Johnson Co.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 7.

Saws, Pumps, and Rollers Listed in 8-Page Catalog

A condensed catalog of its line of contractors' equipment has been issued by the C. H. & E. Mfg. Co., 3849 N. Palmer St., Milwaukee 12, Wis. Items listed in Bulletin No. 153 include portable saw rigs; single and double-diaphragm pumps; self-priming centrifugal pumps; triplex, jetting, and piston pumps; single and double-drum hoists; mortar mixers; bar cutters and bar benders; a 3-ton tandem roller; and a 3-ton trailer.

The catalog is 8 pages long and may be inserted in a 2-hole looseleaf folder. It illustrates each piece of equipment, lists specifications, and describes the features and operating characteristics of each model.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 15.

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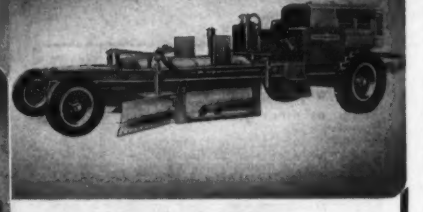

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These machines produce a thorough complete mix in one pass at the lowest costs per ton. For mixing stabilized bases and wearing courses with any type of binder. Capacities from 100 to 350 tons per hour. Lowest initial cost and lowest upkeep cost, yet they produce the best quantity and quality.

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Contractors & Engineers Monthly

470 Fourth Ave., New York 16, N.Y.

Time-Saving By-Pass Is Bituminous-Paved

Waterbound-Macadam Base Is Laid 11-Inches Thick; Topped With Two 1½-Inch Courses of Hot-Mix

✦ THE city of Paducah, on the left bank of the Ohio River in western Kentucky, will no longer be a bottleneck to through traffic on north-south highways. A by-pass has been completed at the western end of the city. Although it is only 1.8 miles long, it permits traffic to avoid the downtown business section of Paducah in following U. S. 45 which enters Kentucky on a bridge over the Ohio. This bridge is located at the western end of Paducah. Once it was crossed, motorists formerly followed U. S. 45 east and south through the city streets until they again gained the open road. With this improvement, traffic now continues nearly due south off the bridge with no turns until it rejoins U. S. 45 south of the city. This by-pass also furnishes important connections for traffic on U. S. 60 and U. S. 62 west of Paducah.

The job got under way September, 1947, when the Kentucky Department of Highways awarded a contract for the by-pass, known as the Paducah Belt Line, to the Municipal Paving Co. of Oak Park, Ill., on its low bid of $238,215.70. Some grading and drainage work was done through the 1947-1948 winter. The project was due to be finished in October, 1948, but bad weather and bad subgrade conditions delayed completion.

Most of the improvement is within the city limits. Its total length of 1.8 miles is divided into 1.4 miles of urban and 0.4 mile of rural road sections, all in McCracken County. Starting at U. S. 45 or Eighth Street, the new highway runs south on what were formerly two undeveloped streets, Thompson Avenue and Joe Clifton Drive, to U. S. 62 or Broadway, near the junction of U. S. 45.

Macadam Base and Black-Top

In the urban section the roadway has a width of 40 feet between curbs. This consists of a 37-foot pavement flanked on either side by a standard 24-inch concrete curb and gutter. The concrete strip abutting the pavement is 18 inches wide and 8 inches thick, with a 6-inch combination concrete curb and gutter poured monolithic. Behind it are 5-foot concrete sidewalks.

The road decreases in width over the non-urban or rural sections to a 24-foot pavement with 8-foot shoulders. The crown on the pavement is ¼ inch to the foot, while the shoulders slope at the rate of ¾ inch to the foot. In the cuts the front slopes are 3 to 1 to a 2-foot rounded ditch. Where the cuts and fills are under 4 feet, the side slopes are 4 to 1; over 4 feet, the slopes are 2 to 1. In the rural sections the base course is laid 25 feet wide, or 6 inches beyond the pavement on each side. In the urban stretch both base course and pavement are the same width, bordered by the curb and gutter at the sides.

The waterbound-macadam base course is 11 inches thick. It was laid in three courses and then covered with two courses of bituminous concrete. Each course is approximately 1½ inches thick, and weighs around 157½ pounds to the square yard. The bottom or binder lift is made up of coarser aggregate than the top or surface course.

Grading

Grading over the old gravel streets, which the new by-pass more or less follows, was light, involving only

(*Continued on next page*)

C. & E. M. Photo

This Wagner Scoopmobile came in handy on the Paducah by-pass job. Here it moves some coarse aggregate from a stockpile to a concrete mixer laying sidewalk pavement.

Vulcan Tools

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

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Time-Saving By-Pass Is Bituminous-Paved

(*Continued from preceding page*)

18,812 cubic yards. Three tractor-scraper units accounted for practically all the earth-moving, with LeTourneau 15-yard Carryall scrapers being pulled by two Caterpillar D8 tractors and one International TD-24. The material was spread in 6-inch lifts and compacted by a sheepsfoot roller. While this was going on, some 8,000 linear feet of storm and sanitary sewer was being laid with concrete pipe from 6 to 36 inches in diameter. Backfill around the pipe and drainage structures, such as manholes and catch basins, was pneumatically tamped with two Ingersoll-Rand tampers driven by an I-R 110-cfm air compressor.

For pouring the concrete curb and gutter, and sidewalk, the contractor mixed his materials in a Jaeger 3-bag mixer, and conveyed the concrete in wheelbarrows to Blaw-Knox steel forms. Stockpiles of sand and stone were spotted along the road at frequent intervals. Water for the mix was taken from the city hydrants to fill an 800-gallon tank mounted on skids. This rig was pulled along to wherever a pour was to be made.

Bag cement for the job was shipped by rail from the Universal Atlas Cement Co. plant at Hannibal, Mo., to a siding of the Illinois Central Railroad in Paducah. From there it was hauled to the job by truck. Sand was supplied by the Federal Materials Co. of Paducah. Stone for the base course, as well as for the concrete, came from the Charles Stone Co. at Cypress, Ill., and was delivered to the job by T. M. Wooldridge, a trucker from across the river in Brookport, Ill. The haul from the quarry to the job site was 35 miles. The sand and stone quantities were weighed out on Johnson scales.

A useful piece of equipment was a Wagner Scoopmobile that was employed on the job to move the stockpiles of aggregate about, when necessary for loading or unloading; or for excavating.

Laying the Stone

After the subgrade had been well compacted, it was leveled off to exact grade by a Caterpillar No. 12 motor grader. Any excess material was windrowed off to the side where the Scoopmobile loaded it into trucks for disposal along the road at some low places. Two 3-yard dump trucks were engaged in these fine-grading operations. Then a 1-inch insulation course was laid on top of the subgrade before any stone was placed for the waterbound base. The stone for the insulation course consisted of around 100 pounds to the square yard of No. 5's; this was choked with about 50 pounds to the square yard of No. 10's. All the stone and screenings were limestone.

From 8 to 10 trucks of various sizes were engaged in hauling stone. The No. 5 stone was spread over the roadbed by Burch spreader boxes, usually in 11-foot lanes. The No. 10 screenings were spread either by the same type of boxes, or by revolving lime-spreader disks at the rear of the trucks, which spread the material out over a wide path. This 1-inch insulation course was well compacted by smooth-wheel rollers; there were four of the 10-ton 3-wheel variety on the job — two Buffalo-Springfields and two Hubers.

The gradation of the No. 5 stone and the No. 10 screenings is as follows:

Sieve Size	Per Cent Passing No. 5 stone	No. 10 screenings
1½-inch	100	....
1-inch	90-100	....
¾-inch	40-75	100
½-inch	5-20	90-100
⅜-inch	0-10	....
No. 4	0-5	....
No. 100	....	5-30

Waterbound Macadam

On top of this 1-inch insulation course went three other courses to complete the 11 inches of waterbound-macadam base. The first course was about 4 inches thick, loose, while the two following courses were slightly less in thickness. When compacted by the rollers, the total thickness of the three larger-stone courses was 10 inches.

C. & E. M. Photo
On the Municipal Paving Co. by-pass contract, a revolving lime-spreader disk distributes No. 10 screenings on an insulation course of No. 5 stone.

Each course of the larger stone weighed about 254 pounds to the square yard. The first course was laid with No. 1 stone, and the two upper courses with No. 2 stone. Each course was choked with around 85 pounds to the square yard of No. 10 screenings.

The gradation of the No. 1 and No. 2 stone is as follows:

Sieve Size	Per Cent Passing No. 1 stone	No. 2 stone
4-inch	100	....
3½-inch	90-100	....
3-inch	....	100
2½-inch	25-60	90-100
2-inch	....	35-70
1½-inch	0-15	0-15

The heavy stone was laid in 10-foot lanes by Adnun Black Top Pavers, and the screenings were placed on top by the Burch spreader boxes. Each lift was well compacted by the rollers. The screenings were worked down into the interstices of the larger stone by fiber bristle brooms about 7 feet wide that were carried at the rear of the rollers, and by the use of hand street brooms. Before the screenings were added, the

(*Concluded on next page*)

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TEXACO

TEXACO

C. & E. M. Photos

At left, a fiber-bristle broom on a Huber roller works screenings into a layer of the macadam base recently built for the Paducah by-pass. Above, water is applied to the base from a 760-gallon tank on a GMC truck. A Novo pump furnishes pressure.

grade over the larger stone was carefully checked with straight-edges, and any necessary adjustments in the thickness of the stone were made by hand by a gang of stone men passing over that course.

After all the chinks in the larger stone had been filled by rolling and brooming the screenings into the course, that lift was then well saturated with water. This was done with water obtained from the city system and sprayed from a 760-gallon tank mounted on a GMC truck. At the rear of the truck was a 10-foot spray bar equipped with 20 nozzles. The water was forced out under pressure by means of a Novo 2-inch pump mounted at the rear of the truck just over the spray bar. More rolling followed until the water ran out of the stone. Each course was permitted to dry thoroughly before the next lift was laid. As the limestone screenings dried out within the layer of limestone, the base took on the appearance and solidity of a concrete slab.

Black-Top Pavement

When the 11-inch base course had dried out, it was given a prime coat of RT-2 tar at the rate of 0.25 gallon to the square yard. Bituminous material was supplied by the Lion Oil Co. of El Dorado, Ark., and shipped to Paducah in tank cars. It was applied by an Etnyre 1,000-gallon distributor mounted on a Sterling truck.

To mix the bituminous concrete for the binder and surface courses, the contractor set up a Cedarapids asphalt plant with a 2-ton pugmill about a 2-mile haul from the job. The plant-mix was hauled to the job in from 10 to 12 trucks and laid by the Adnun Black Top Pavers. Compaction was achieved by two Buffalo-Springfield tandem rollers—an 8-ton and a 10-ton model.

The gradation of aggregate in the binder and surface courses is as follows:

Sieve Size	Per Cent Passing Binder Course	Surface Course
1-inch	100	....
¾-inch	90-100	....
½-inch	....	100
⅜-inch	55-80	50-65
No. 4	35-50	35-50
No. 8	25-35	35-50
No. 16	....	20-40
No. 50	0-15	2-20
No. 100	....	0-10
No. 200	0-5	0-5
Asphalt, 120-150 penetration	4-7	4-8

Quantities and Personnel

The major items in the 1.8-mile by-pass construction contract were as follows:

Excavation	18,812 cu. yds.
Concrete sidewalk, 4-inch	6,318 sq. yds.
Crushed aggregate No. 1	5,520 tons
Crushed aggregate No. 2	12,870 tons
Crushed aggregate No. 5	1,840 tons
Crushed-limestone screenings No. 10	7,055 tons
RT-2 tar, prime coat	13,190 gals.
Bituminous-concrete binder	3,040 tons
Bituminous-concrete surface	3,565 tons
Curb and gutter	12,210 lin. ft.

For the Municipal Paving Co. of Oak Park, Ill., William F. Knarr was Superintendent.

S. H. Andrews was Resident Engineer for the Kentucky Department of Highways. The Paducah by-pass is located in District 1 of which Lee Puryear is District Engineer. The Department is headed by Garret L. Withers, Commissioner, with Dwight H. Bray, State Highway Engineer. C. B. Owens is Director of Construction.

Euclid Ups J. E. Ehlert

The Euclid Road Machinery Co. has appointed J. E. Ehlert District Manager of its northeast territory. Mr. Ehlert will cover the states of Maine, New Hampshire, Rhode Island, eastern Massachusetts, and Vermont. He will also cover New Brunswick, Nova Scotia, Newfoundland, and Prince Edward Island in Canada.

Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

Three New Excavators Feature Air Control

New ¾-cubic-yard excavators and material handlers are announced by The General Excavator Co., 220 Rose St., Marion, Ohio. The Model 310 is a crawler-mounted shovel, dragline, clamshell, crane, and hoe; the Model 312 is a pneumatic-tire-mounted shovel, crane, clamshell, and hoe; and the Model 315 Mobilcrane is a one-engine one-man-operated machine mounted on pneumatic tires.

All basic motions on the 310 are controlled by air. The air-tube clutches are designed to apply metered air power to the working parts to achieve smoothness of operation. General-designed air seals convey the air, under pressure, through the end of the hoist-drum shaft to the cylinders controlling the hoisting clutches. A special coupling takes the air down through the center travel shaft to the steering clutches and brakes. Independent travel is standard on the 310. A heavy-duty transmission provides two speeds forward and two in reverse. An enclosed spur-gear drive carries power to the vertical travel shaft. The enclosed travel gears operate in oil.

The worm-gear-driven boom hoist is independent of other motions. Where independent boom hoist is not needed, the clutch which raises the boom unit also serves as the retract clutch. The boom-hoist worm is carried in anti-friction bearings. A spring-set air-released brake band is designed to provide added safety. Four hook-type swing rollers—turning between flanges on the roller path—are said to stabilize the superstructure. A gudgeon on the crawler frame centers the superstructure on the crawlers.

The Model 312 has the same features as the 310 with the exception of the travel mechanism on the superstructure. It has a one-man cab set off at the extreme left side. The Model 315 is not yet in production, but complete details will be available soon.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 49.

Generators in Two Styles

Two new bulletins have been released by the Kato Engineering Co., Mankato, Minn. Form 1349 deals with the Katolight gasoline-engine-driven generators; Form 11248, with the Katolight switchboardless generators.

Air controls all the basic motions of this Model 310 ¾-cubic-yard Mobilcrane.

Generator plants listed in Form 1349 are the 500-watt ac Series 23; the 600-watt ac Series 14; the 1,000-watt ac Series 26; and the 2,000-watt ac Series 30. For each model in the series the bulletin lists specifications for its power unit, standard equipment supplied with it, and the accessories which are available. Each unit is illustrated.

The bulletin on the switchboardless generators lists the advantages claimed for this type of equipment, points out how the Kato engineers have succeeded in designing the unit so that a separate switchboard is not needed, indicates how the rotors are banded, and illustrates two generators of this type.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. For Bulletin 1349, circle No. 90; for Bulletin 11248, circle No. 91.

Hurstco, Inc., Changes Name

Hurst Lewis, President, announces a change of name from Hurstco, Inc. to Concrete Sawing Equipment, Inc. Offices are located at 265 N. Vinedo Ave., Pasadena 8, Calif. This company formerly did business under the name of Hurstco, Inc., from its offices at 117 E. Colorado Blvd., also in Pasadena. It will continue to make the Concut concrete-sawing machine.

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Engineering Courses Need a Broader Base

Must Do More Than Teach Students to Make Living; Technical Specialization On Graduate Level

✦ HIGHER education in general is on the witness stand these days in America, receiving a long hard look of appraisal—and engineering education is no exception. Both have recently been cross-examined in public hearing: the one by the President's Commission on Higher Education in its report entitled "Higher Education for American Democracy"; and the other by engineering faculty members of The George Washington University in two papers presented to the Educational Division of the American Road Builders' Association at its 46th annual meeting.

Dr. Bruce D. Greenshields, Professor of Civil Engineering, summed up his findings in a paper entitled "An Appraisal of Engineering Education — Something to Think About". Defendant, he charged, is failing to turn out more and better engineers because its inadequate salaries are failing to attract enough competent teachers — and because its curriculum needs broadening and liberalizing. Carl H. Walther, Assistant Dean of Engineering, concurred in a paper entitled "Is Our Engineering Education Too Materialistic?". Defendant is too concerned, he said, with teaching young men merely how to make a living.

Prosecution did not rest with charges alone, however. Defendant, far from being a confirmed miscreant, is highly susceptible of wise guidance and redirection, Professor Greenshields and Dean Walther implied, and they were generous in making suggestions.

Low Teaching Salaries

"Before we can have better highways, we must have better engineers. Before we can have better engineers, we must have better colleges. Before we can have better colleges, we must have better teachers", said Professor Greenshields, tracing the vicious circle. And before we can have better teachers, we must pay them better salaries. An average instructor in civil engineering spends about 60 hours a week at work and study. And for this he may receive a smaller salary than a government clerk.

Perhaps some of the fault may lie with the teacher himself, for by the very nature of his training he is poorly equipped to meet the rough-and-tumble competition that prevails between big businesses and between labor and business. But this characterization applies probably in less degree to engineers. And in any case, we would hardly advocate changing the ideals and codes of behavior of the educator and the engineer. There must be other ways of solving the problem of low salaries for teachers and highway engineers.

Federal Aid a Solution?

Many suggestions have been made. But Federal aid to hard-pressed private colleges is receiving perhaps the most attention. The step would be a logical one, said Professor Greenshields, for it is high taxes that have dried up the source of endowments to colleges. Moreover, it would be poor economy to force our private institutions out of existence only to have to replace them with state or Federal universities. But Federal aid, if adopted as a solution, should be without any strings. It would be better to deny the gift of Government money than to let our private colleges become politically controlled.

In the last analysis, the problem of engineering education is too complex to be solved merely by finding money enough to hire competent teachers. For college education goes beyond the teaching of practical techniques, said Professor Greenshields. Even engineering education is more than technical training, for "engineering" means "skillful or tactful management" as well as "the science and art of constructing and using machinery or of designing and constructing buildings, bridges, and roads".

Curriculum Needs Broadening

Engineering education needs to be broadened and liberalized. This is not news, said Professor Greenshields. The problem is how to accomplish it, along with a technical education, in four college years.

If the time is to be kept to four years, he said, it would be better to sacrifice professional training in favor of broader fundamentals. And this would mean that specialized training should be given at the graduate level in work leading to a master's or doctor's degree.

The best that can be done in the way of undergraduate highway engineering training is to give a survey course devoted largely to familiarizing the student with the work in that field. This should enable him to decide whether or not he wants to go into it and undertake the highly specialized, graduate training needed these days to turn out a thoroughly competent engineer.

In his graduate research work, he would also learn the difference between fundamental and practical research. For Professor Greenshields believes we are deficient in the emphasis we place upon fundamental research. What we usually mean by "research" is development work. We are looking for something that can be put to practical use in the immediate future instead of something that pays far bigger dividends in the more-distant future.

A Livelihood the Only Goal?

Our schools must do more than teach

(*Concluded on next page*)

for solving your *and*

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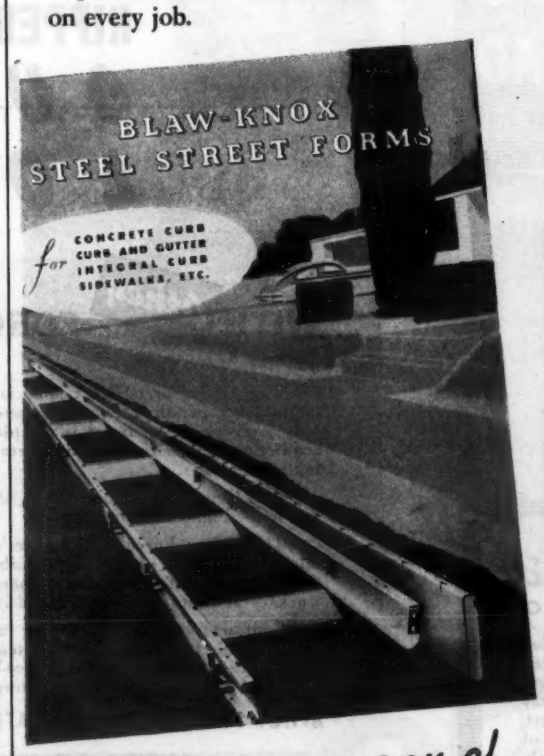

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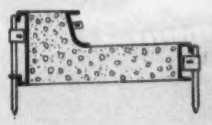

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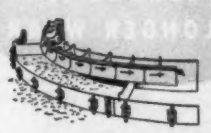

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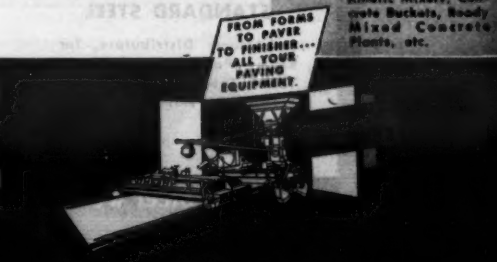


Engineering Courses Need a Broader Base

(Continued from preceding page)

students merely how to make a living, urged Dean Walther, the other speaker. Road builders know that surely, for they have established a notable record for vision—for considering more than the technical aspects of road design. Highway safety, for example, they treat as a *total* problem, involving social values as well as engineering, economics, and psychology.

All of us know that jobs aren't just a way to make a living. Hardly one of us thinks of his job solely as a way to pay the butcher and the baker and the income-tax collector, with perhaps a little left over for greens fees at the golf course. No one of us would deny that he weighs some un-weighables—personal accomplishments, for example—very heavily in the scales of life.

Yet how many young college engineering students rather despise all non-engineering courses—"because they're not practical". In their material-mindedness, they think that a more abundant material life is all that is necessary for happiness, that material gadgets in sufficient quantity will automatically guarantee the fuller life, and that their slide rules and formulae and engineering technique can provide it.

There is also the graduate of several years' standing who is too busy to give some time to service in his professional society—since he "doesn't get anything out of it". These folks will eventually get where they want to go, said Dean Walther. They will reach their goals. And when they do, they'll wonder why they are bored and dissatisfied.

Civilization and Technical Skills

As Professor Arnold Toynbee seeks to demonstrate in his recent book "A Study of History", there appears to be no direct connection between a civilization's technical achievement and its growth or decline. Techniques have often continued unimpaired, or have even been improved, long after a society is clearly on the downward path of disintegration. Witness the Greeks and Romans, who had accumulated an impressive array of technical achievements by the beginning of the Christian era, and were still steadily pressing forward in the technical front—but whose civilization had begun its breakdown four centuries before, in the Atheno-Peloponnesian War.

Breakdown of a civilization occurs, said Dean Walther, quoting Toynbee, when the creative minority, the leaders, lose their creative power—in short, when moral or spiritual sterility sets in. And it may well be that the great challenge our society must meet, in order to survive, is its own materialism.

Humanities Not Enough

Our current concern over education is a sign that we are coming to recognize the challenge, said Dean Walther. The American Society for Engineering Education, for example, has pointed out the need for a "humanistic-social stem" of courses in engineering schools. Engineers everywhere are debating the value of the Humanities. Some engineering schools are even experimenting with curricula which include study in the Humanities and social sciences to balance the previous overemphasis on exclusively technical subjects.

As soon as we state the elementary fact that young engineers should have some knowledge of the social, economic, and political structure of the world they live in—and some understanding and enjoyment of its cultural activities—we are compelled to admit the value of humanistic and social studies.

But something even besides technical proficiency and humanistic knowledge is needed to complete the equation for an adequate and balanced personality. Unless education is integrated with a philosophy of life and directed by a dominant worthwhile purpose, it is of doubtful human value. Dean Walther calls this third factor a "moral faith"—a profound belief in the principles of right and wrong in behavior towards other men.

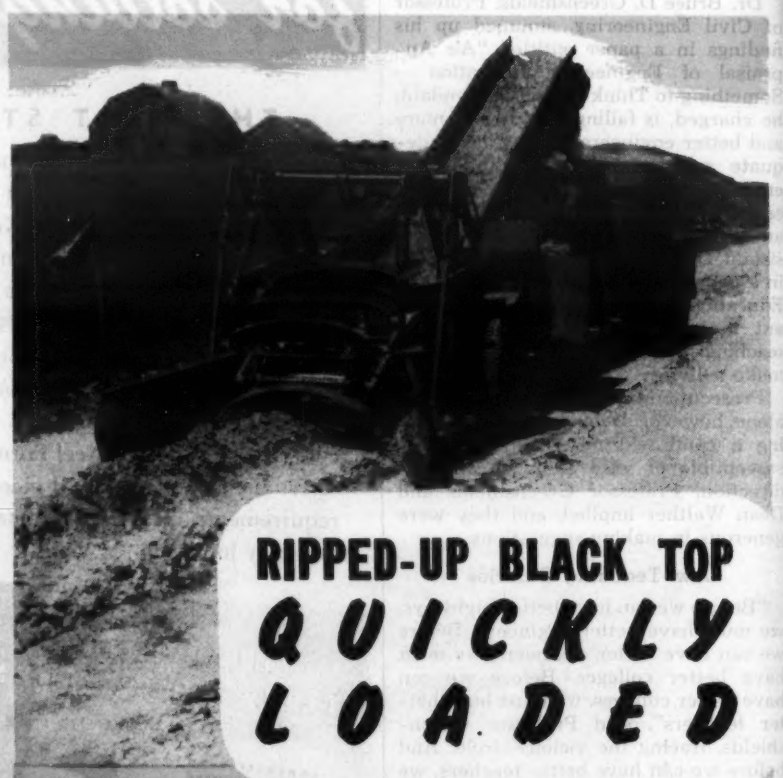
It seems unlikely that this moral faith can be inculcated in students by providing another course in a curriculum. But Dean Walther does firmly believe that it can be learned, and that it is our task to create an atmosphere in which it can be learned—in our schools and colleges, in our homes, and in our business relations.

We need many more people thinking in the broad field of human relationships—not just politics or economics or engineering professional status, but the relation of a man to other men and the true nature of his relation to himself. This is our challenge, Dean Walther holds, and he urges:

"Gentlemen, let us 'stand up to be counted' at every opportunity. We know that the most effective precept is that of example. Let us therefore feel and act and speak out against a blind worship of materialistic techniques. Let us state again our faith in the value of those elementary human virtues of industry and honesty, of tolerance and charity, and dedication to service. This is one way in which we can *all* help our profession and our civilization to grow ever more creative and more secure."

Pres. of Walter Truck Dies

The Walter Motor Truck Co. announces with regret the death of its President, Lawrence G. Stelzle.



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STANDARD STEEL
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The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"

WRITE FOR CATALOG 424

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Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.

Built to the Highest Standard

Standard Steel Works NORTH KANSAS CITY, MO.

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Please send me further information on the new products and also copies of catalogs described in this issue, as circled below.

1	2	3	4	5	6	7	8	9	10	71	72	73	74	75	76	77	78	79	80
11	12	13	14	15	16	17	18	19	20	81	82	83	84	85	86	87	88	98	90
21	22	23	24	25	26	27	28	29	30	91	92	93	94	95	96	97	98	99	100
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51	52	53	54	55	56	57	58	59	60	115	116	117	118	119	120	121			
61	62	63	64	65	66	67	68	69	70	122	123	124	125	126	127	128			

I would also like manufacturer's literature on:_____

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Company_____

Address_____

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Contractors and Engineers Monthly - Request Card - April '49

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I would also like manufacturer's literature on:_____

_____

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

This Model 44 Corsair is convertible to all crane and shovel attachments. The tandem-type carrier is designed for crane mounting.

Truck-Mounted Crane Has a ½-Yard Capacity

A 10-ton truck-mounted crane and excavator is announced by the Wayne Crane Division of the American Steel Dredge Co., 2000 Taylor St., Fort Wayne 2, Ind. The Model 44 Corsair has a ½-cubic-yard capacity and is convertible to all crane and shovel attachments. It has a swing speed of 5½ rpm and will travel at regular truck speeds.

The 6-wheel tandem-type carrier is especially designed for crane mounting, the manufacturer states. It has a 16-inch 45-pound steel I-beam construction. The outrigger tubes are built integrally with the frame, with one pair ahead of the front wheels and one pair behind the rear wheels. Boom clearance and visibility are extended by the use of a one-man offset cab and tapered frame ends. Other features include tandem drive, 8 or 10-tire traction, and a differential lock for heavy off-the-road work. An auxiliary transmission provides 10 speeds forward and 2 in reverse. Power is supplied by a 6-cylinder gasoline engine rated at 105 hp at 3,200 rpm. A comparable diesel-engine power unit is optional.

The crane also features four 20-inch clutches, enclosed gears running in oil, and a worm-driven boom hoist. Oversized shafts revolving on anti-friction bearings are said to reduce wear and upkeep costs. The upper works is held in position by conical hook rollers and revolves on a 48-inch-diameter ball bearing. Safety features include a full-vision cab, boom snubbers, and a spring-loaded boom check brake. The crane is powered by an 8-cylinder gasoline engine which develops 62 hp at 1,800 rpm. Diesel operation is optional.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 74.

Selecting a Compressor

A chart to aid in selecting the proper size of compressor for a specific job has been made available by the Worthington Pump & Machinery Corp., Publications Dept., Harrison, N. J. This chart indicates the bore and stroke required under certain operating conditions.

The Worthington chart is based on normal applications handling air with an atmospheric intake pressure, and is for use with the Model HB single, horizontal compressors. It has been prepared in such a way that it provides a quick comparison between the discharge pressures in pounds per square inch and the piston displacement in cubic feet per minute.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 96.

Represents Cleco in South

Glenn Logan is named Special Representative of the Cleco Division of the Reed Roller Bit Co. Mr. Logan will act as liaison between the General Sales Office in Houston and local dealer organizations in the southern area. His office is located at 502 Teters Bldg., Atlanta, Ga.

Heavy-Duty Trucks Are Diesel-Powered

Diesel-powered trucks in two new models are announced by the Motor Truck Division of the International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. The KBD-12 has a gross vehicle weight of 31,500 pounds; the KBRD-14, 35,000 pounds. Both are powered by Cummins Model HRB-600 diesel engines designed to develop 165 maximum horsepower at 1,800 rpm.

The KBD-12 is available in four wheelbases of 155, 161, 179, and 215 inches, and is recommended by the company for over-the-road and truck-trailer operations. It comes with single or double-reduction drive or two-speed rear axles, each available in three axle ratios.

The KBRD-14 is available in 161, 179, and 215-inch wheelbases, and is for off-the-highway work. It offers an option of either double-reduction final drive with five ratios or a two-speed rear axle with 6.41 and 8.38 ratios. Standard tires are 11:00 x 20, with 11:00 x 22, 11:00 x 24, 12:00 x 20, and 12:00 x 24, as optional equipment.

Each model has a five-forward-speed transmission with either a direct or overdrive fifth speed. Two optional auxiliary transmissions are available except in the 155-inch-wheelbase chassis.

Features of the Cummins engine include new sleeves, pistons, and head gaskets; an increased-flow lubricating system; continuous groove bearings; large air cleaner; a 5-foot-long 6-inch-diameter muffler; a 4-inch-diameter exhaust stack; and a 15-inch single-plate dry-disk clutch. The engine has a 5⅛-inch bore, 6-inch stroke, and a displacement of 743 cubic inches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 100.

Tribute from Operation **"SNOWBOUND"** *to* **DAVENPORT-FRINK SNO-PLOWS**

ALL TYPES AND SIZES

"In behalf of the people of Cherry County, Nebraska, and of myself, I wish to sincerely thank you for the promptness and consideration given to our request for plows to help meet the snow disaster. Your plows have proved themselves to be highly effective in opening trails through some of the worst terrain imaginable. They were used on our rough, choppy sandhills far from any road, or semblance of trail, and at times in snow so deep and hard that a power unit was used to push the truck on which they were mounted. It appears that your plows are unbreakable."

(Name on Request)

DAVENPORT BESLER CORPORATION Dept. A DAVENPORT, IOWA

Made in Eastern U.S.A. by CARL H. FRINK 1000 Islands, CLAYTON, NEW YORK

ESCO 9-yard stripping dragline owned by J. Robert Bazley, Inc., working at Logan stripping near Mt. Carmel, Penn.

and still on the job 3 shifts a day...

The *ESCO* dragline bucket shown at the left went into service in April, 1945. As of September 30, 1948, it had —

Operated 7,143 hours.
Moved 1,411,915 yards of original material.

Maintenance cost during this time averaged .00589 cents a yard. This record was made in the anthracite region of Pennsylvania where digging conditions are notoriously severe — *and the bucket is still operating three shifts a day.*

Performance like this is typical of *ESCO* dragline buckets in all parts of the world. It is made possible by sound engineering and bulk-saving construction which provide for:

Clean cutting lip for positive bite
Balance for smooth carrying
Control for exact spotting
Hollow cast arch for greater strength
Streamlined for quick dumping
Manganese steel for all wearing parts
No unnecessary bulk.

Result: More payloads per pass, and more passes per hour

ESCO dragline buckets are made in four types — medium, standard, stripping and heavy duty, in capacities ranging from ⅜ to 20 yards. One of these buckets will do your job faster and easier with less maintenance and "down" time. For specifications and other detailed information, see your nearest *ESCO* representative or fill in and mail the coupon below. Electric Steel Foundry, 2169 N.W. 25th Avenue, Portland, Oregon; 720 Porter Street, Danville, Illinois. Offices in Pottsville, Pa.; Eugene, Oregon; Chicago, Honolulu, Houston, Los Angeles, New York, San Francisco, Seattle, Spokane.

ESCO stripping dragline bucket, with manganese steel parts shown in red.

ELECTRIC STEEL FOUNDRY
2169 N.W. 25th Avenue, Portland 10, Oregon
Please send information on ☐ Medium dragline; ☐ Standard dragline; ☐ Stripping dragline; ☐ Heavy Duty dragline.

Name_____

Address_____ Zone_____

City_____ State_____

ESCO

DRAGLINE and DIPPER BUCKETS

C. & E. M. Photos
The D8-mounted bulldozer at left blades a steep cut slope on the Grant Construction Co. grading job near Sandpoint, Idaho. Above, a mobile grease and fuel rig services a Super C Tournapull in the field.

Quicksand Slows Grading Project

Treacherous Formation Follows Bad Floods to Complicate Excavation For New Highway

✦ EARLY last year, the worst floods northern Idaho has had in 90 years made news all over the nation. Mountain snows and rain, running off at the same time, sent streams to all-time-high levels in that part of the state. As an aftermath of the disaster, construction work on highways was slowed down because of the mucky wake of the flood.

One of the best examples of this havoc was a new grading job 4½ miles long on U. S. 10 Alternate, just east of Sandpoint, Idaho, and not far from the Canadian line. There a project which was let in October, 1947, was still under construction a year later, since the contractor had been able to work only a few months in the first year. Grant Construction Co. of Springville, Utah, had the $200,000 contract with the Idaho Bureau of Highways.

The all-time-high water levels raised the natural water table all over the region, and some sections of the highway were flooded. Consequently, much of the excavation work was done in quaky quicksand, waterlogged and soft. An unusually cold, wet summer season followed the May-June floods to make the job extraordinarily tough.

The Grant Construction Co. contract included about 200,000 cubic yards of common excavation, a 12-inch pit-run course of granular base, a 4-inch course of select crushed sub-base, a single-penetration course of bituminous macadam, topped by an armor coat of asphalt seal and stone chips. Completion of the job is expected to improve an important section of the east-west main highway through the scenic country of northern Idaho.

Construction plans called for 4 to 1 backslopes, a 36-foot width of crushed material, and a 24-foot bituminous surface mat, to bring the highway up to modern standards. If the flexible base proves to be too thin, it will be raised at a later date, probably by maintenance forces.

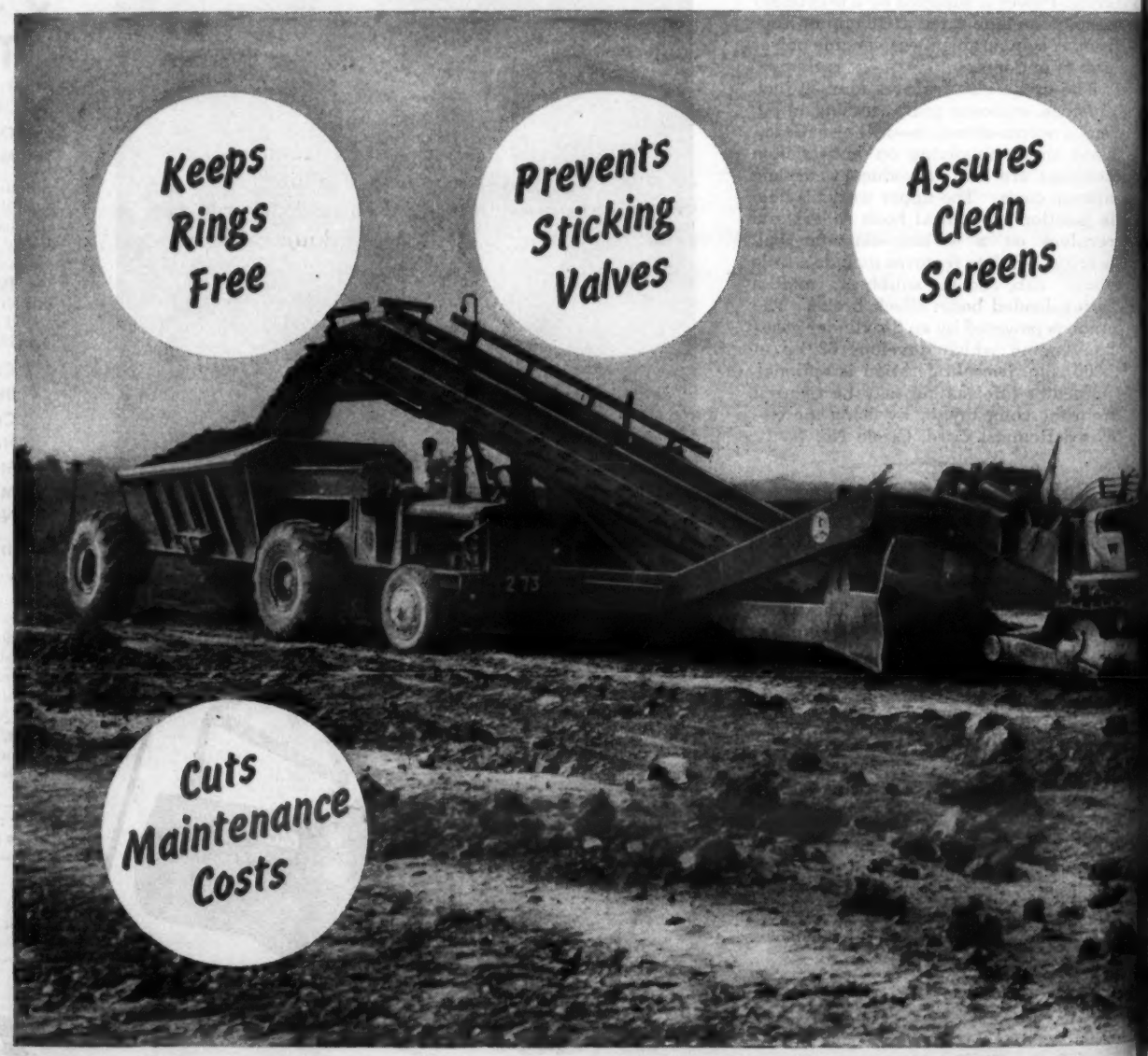
Selection of Equipment

The job combined relatively short hauls with wet, soft conditions underfoot. It seemed a natural for tractor equipment, so two LeTourneau 18-yard Carryalls with D8 Caterpillar power were brought in, plus two more D8's with 15-yard LeTourneau Carryalls, two D8's with bulldozers, a D7-mounted dozer, and three Super C Tournapulls. The Tournapulls were not used extensively on this job, because there was not much long-haul work. For a time they were used near Priest River, where Grant had another grading project under way for the Public Roads Administration.

Processing equipment for the compaction of earth included three sections of LeTourneau and Bucyrus-Erie sheepsfoot rollers pulled by International TD-18 tractors. Two water tanks, mounted on Mack trucks, were also on hand. Capacity of the tanks was 2,000 and 4,000 gallons. Last but not least was a LeTourneau Rooter, which saw plenty of abuse in the one deep cut

(Continued on next page)

SINCLAIR TENOL
Engines Clean



SINCLAIR

YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE

C. & E. M. Photos
This portable Pioneer 40-V crushing plant processed select base-course material for the job on U. S. 10 Alternate in northern Idaho. The view above, from the driving end, shows the Caterpillar D17000 diesel engine which powered it. Note the D8 bulldozer feeding the plant in the background.

on the job.

Work started, when weather permitted, on a basis of two shifts per day. A small shop and yard was established for equipment repairs, to insure the steady operation of the machines.

Grading Soon Gets Tough

The route under construction generally paralleled the old road, with here and there an intersection. Traffic continued to use the existing road while work was in progress, and the intersections were guarded by flagmen.

The material to be moved consisted of waterlogged minus-200-mesh grainy material and various other sandy formations. In one big cut a deposit of conglomerate was found, loaded with large boulders. Pit-run material was excavated from this cut as a part of grading, but the excavation here proved difficult.

When grading began on the waterlogged quicksand, operators and foremen alike knew they were in for trouble. The quicksand dug easily enough, but after only a foot or two had been scooped away, springs started bubbling up all over the place and the machines began to mire.

The only successful way to grade this material seemed to be to let the machines do what they could, and then, when the springs appeared, to move away to another location and give the place a week or so to dry out. This procedure was followed on all the quicksand, and paid off better than attempts to dry it up with pumps.

Several culvert pipes which had to be set ahead of grading caused difficulty. A Michigan truck crane was used to set the plates as the pipe was assembled, but considerable excess yardage had to be clammed out to make the structural excavation, and pumps ran the whole time these holes were open.

The material was wetter than what is ordinarily suitable for fill, so it had to be spread out thin and given some aeration to evaporate part of the moisture before the sheepsfoot rollers tamped the lifts to density. Densities on the job averaged about 90 per cent, due to the unfavorable grading circumstances existing.

Grading the deep cut to produce pit-run base material turned out to be even trickier than the quicksand because it was so hard on equipment. Through the entire pocket of conglomerate lay boulders up to 20 inches in diameter. These boulders had to be loosened up so the material could be loaded by the long-haul Tournapulls.

A LeTourneau Rooter, working behind a D8, was used here. It loosened the formation through all of the cut except one small area, which had to be shot. The Super C Tournapulls then moved in with a pusher tractor, loaded the material, and hauled it to the job. As the loads were dumped, a Caterpillar No. 12 motor grader leveled the gravel and swept the excess big boulders aside in a windrow. These were picked up later by empty Tournapulls and disposed of in the bottom of earth fills. Some 199 cubic yards of pit-run material was put in per station, then watered and rolled.

The slopes of all cut- and fill-sections were first roughed in by a Caterpillar D8 tractor and its bulldozer blade. The No. 12 motor grader was then used, working from the bottom of the cut if possible. In several places it was necessary to tie a cable between the grader and a D8 on top of the bank to permit the motor grader to do its job without turning turtle.

(Concluded on next page)

Keeps Heavy-duty As It Lubricates

When sludge, carbon, gum or varnish are present in an engine, it means TROUBLE . . . sticky valve stems, stuck rings, clogged oil lines and screens. This leads to early and frequent overhaul and costly maintenance.

With Sinclair TENOL as the lubricant, these troubles need not be a problem—for TENOL keeps engines clean as it lubricates. Specially developed Sinclair additives retard oxidation and prevent gum and varnish from choking piston ring grooves, sticking valves, clogging oil passages and pump screens. Soot, sludge and fuel contaminents are kept in suspension and drained out with the oil at oil change periods. So clean up and keep clean with Sinclair TENOL—for diesels and other heavy-duty engines.

This Pilot Plant, part of the great Sinclair Research Laboratory at Harvey, Ill., provides space for six miniature operating replicas of commercial-sized refinery units. Continuous research explains the high quality of TENOL and other Sinclair Oils.

Making a study of crystal structure of catalysts, this Sinclair researcher at Harvey uses physical chemistry to develop refinery techniques in a never ending effort to bring industry better petroleum products at lower costs.

HEAVY DUTY LUBRICANTS

FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.

Quicksand Hampers Road-Grading Project

(*Continued from preceding page*)

Select Crushed Base

The 4-inch select base course, of ¾-inch-maximum size rock, was manufactured by a new portable crusher. Despite extensive exploration, no suitable material could be found throughout the job, so it was necessary to go about 10 miles down the east shore of Lake Pend Oreille. A pit of well graded boulders and gravel was available there.

Approximately 125 tons per hour for a 10-hour-per-day run was needed. A new portable Pioneer No. 40-V duplex plant was moved in and set up, powered by a Caterpillar D17000 diesel engine. Auxiliary equipment for the plant included a Pioneer feeder, two Pioneer conveyor runs, and a Pioneer 2-compartment surge bin, under which the hauling trucks were loaded.

The Pioneer plant was fed by a Caterpillar D8 bulldozer, which pushed the pit-run material into the primary feeder hopper. The material then traveled up the first conveyor, through the jaw and roll crushers of the plant, over a series of classifying screens, and into the surge bin.

Five big Mack dump trucks, each capable of hauling an 18-ton load, transported the crushed rock.

The material was then laid down according to the predetermined distance for each load, and spread to final smoothness by the Caterpillar motor grader. The crushed rock was compacted by a pneumatic and a smooth-steel-wheel roller.

When the project was visited, no bituminous work had been started, and none was likely until all the grade had been finished for the new highway. When this was done, the surface was sealed with a light coat of SC-1 asphalt, which also primed the surface for the penetration treatment. Penetration treatment consisted of 0.75 gallon of MC-4 asphalt per square yard, followed by an application of chips. These were thoroughly rolled down to bond them in the asphalt. The surface was then sealed, and armor-coat chips were added.

As present-day highway jobs go, this one was relatively small, but it had perhaps as many headaches per square foot as any grading job of 1948, according to the men who battled it through to completion. The new road was scheduled to be finished and put into service, and the old parallel road abandoned by November 1, 1948.

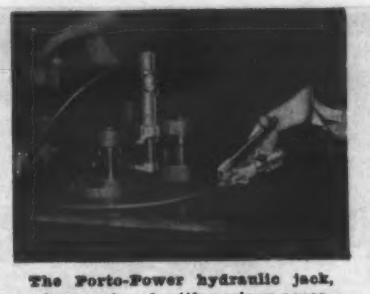
Personnel

The job was designed and supervised by James Reid, Director of Highways, with R. M. Parsons as District Engineer at the Coeur d'Alene headquarters.

Floyd Creer directed field work for the contractor, assisted by J. W. Grant. Don Hickman, Wayne Beck, and Fred Kennedy were Foremen, and John Smith was Master Mechanic.

President for Gar Wood

Edward F. Fisher is the new President of Gar Wood Industries, Inc. He is one of the founders of Fisher Body.



The Porto-Power hydraulic jack, when equipped with various accessories, can be used for pulling, spreading, clamping, pressing, pushing, bending, and lifting.

Attachment Kit for Jack

A wall case to hold attachments for the Porto-Power is now available from the Blackhawk Mfg. Co., 5535 W. Rogers St., Milwaukee 1, Wis. The Porto-Power is a hydraulic jack which, when equipped with various accessories, can be used for pulling, spreading, clamping, pressing, pushing, bending, and lifting operations.

The wall case is designed to save steps, speed work, and add new portability to the equipment. It can be hung over a workbench, placed on the floor next to the job, or positioned on a portable bench. The case is finished in white enamel and measures 24¼ x 13¼ x 4¾ inches.

Blackhawk also announces that a new Bantam set is available, making a total of five basic assortments. The SA-17 can be furnished separately or in combination with a case; the combination is listed as the SA-19 assortment. The SA-18 assortment consists of the SA-16 set combined with a wall case. The case can also be purchased separately for sets now in use.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 79.

Bear Succeeds Adm. Moreell

Ernest R. Bear has been elected a Director of the Turner Construction Co. He fills the vacancy occasioned by the resignation of Admiral Ben Moreell. Mr. Bear has been Vice President in Charge of the Turner Philadelphia office since 1947.

Convertible Crane Unit

A truck-crane unit, convertible to operation as a shovel, pull shovel, dragline, or clamshell, is described in a 4-page catalog available from the Koehring Co., 3026 W. Concordia Ave., Milwaukee 10, Wis. The Model 304 is self-propelled and pneumatic-tire-mounted, and has a rated capacity of 40,000 pounds.

Bulletin K-245 covers the operation and features of the Model 304 and shows several photographs of the machine in use. Tables give information on its lifting capacities when used as a crane and when used as a clamshell or dragline. Data on length, height, width, and wheelbase are provided.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No 81.

ROSCO MINNEAPOLIS ROAD OIL DISTRIBUTORS STREET FLUSHERS and CLEANERS • MAINTAINERS

ROSCO MFG. CO., 3124 SNELLING AVENUE MINNEAPOLIS 6, MINN.

Please send me your pocket-size pamphlet that pictures and describes your entire line of equipment.

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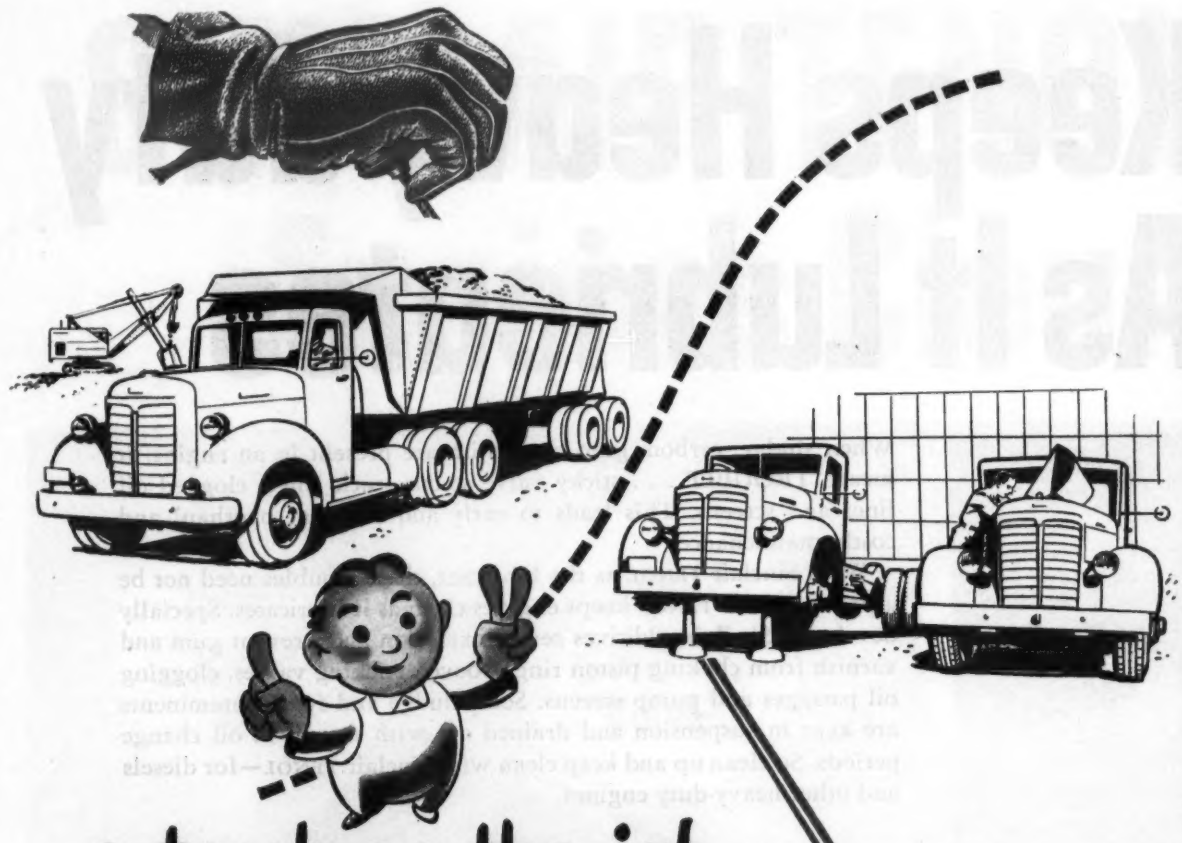
ALSO *send me complete data on:*

PASTE THIS TO A PENNY CARD AND MAIL



a truck on the job is worth two in the shop

. . . or, to carry the old adage even further, a truck on the road is worth *a whole fleet* in the shop. Your rigs make money for you only when they operate with a minimum of maintenance and repair.

You'll get real transmission performance . . . thousands of miles of rugged road service without major repairs or parts replacement . . . by standardizing on Fuller Transmissions throughout your fleet.

Long wear-life and low maintenance are inbuilt characteristics of Fuller Transmissions . . . characteristics that give you extra miles and extra profits. Write for the catalog which describes each of Fuller's proved-in-the-field transmissions.

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1060 East 11th Street, Oakland 6, California

Fuller TRANSMISSIONS

Big Concrete Siphon On Irrigation Work

Special Traveling Forms Used by Contractor to Pour Reinforced-Concrete 23-Foot Siphon Barrel

By RAYMOND P. DAY,
Western Editor

✦ ABOUT 2 miles south of Coulee City, Wash., one of the important links of the Columbia Basin irrigation project is under construction. Known as Bacon Siphon, the big reinforced-concrete pipe will carry 6,600 cfs of irrigation water across a dry coulee to irrigable lands farther south.

The San Francisco contracting firm of T. E. Connolly, Inc., is doing the job under a $3,500,000 contract with the Boise Office of the U. S. Bureau of Reclamation. Connolly's job includes not only construction of the 1,000-foot-long Bacon Siphon, but also the excavation and concrete lining of Bacon Tunnel, which ties on to the south end of the siphon at the base of a high lava ridge. Tunnel excavation was featured in a previous article (see C. & E. M., March, 1948, pg. 39).

Bacon Siphon is circular throughout, with thickened haunches where it meets the earth. Its inside diameter is 23 feet 3 inches and it has 23-inch reinforced-concrete walls. The bottom of the dry coulee through which it passes is at elevation 1,426. The north end of the siphon, where it leaves the main canal, is at elevation 1,512.24—86 feet above the low point of the siphon barrel. The south end of the siphon, where it discharges into Bacon Tunnel, is at elevation 1,510.44.

Excavation Is Tough

Excavating a bed for the big siphon in rough, solid lava rock was a hard job. Only a relatively shallow bed had to be prepared, however, so pneumatic drills were used. Ten Ingersoll-Rand 55-pound Jackhamers saw action there, with 8-foot-maximum steel and detachable bits. Compressed air was taken from the compressor house at the tunnel and piped over to the small drills. The amount of air they used hardly affected the performance of the big compressors.

The solid lava rock was drilled and shot about 12 inches below grade. A new Northwest 80-D 2½-yard machine, rigged as a shovel, mucked out the broken rock. It was possible in most places to dispose of the material by casting, assisted somewhat by a Caterpillar D8 and a bulldozer blade.

On the south end of the siphon, and through some of the coulee bottom, material was found which could be dug without shooting. The dragline boom and a 3-yard bucket were installed on the Northwest machine to do this work.

After the excavation was roughed in, fine gravel from a near-by pit was hauled in by trucks, dumped, spread in thin lifts, and built up with the aid of Chicago Pneumatic tampers. The material was put down to good density and checked very carefully with surveying instruments, because a solid, dense foundation was one of the most important features of the work.

Special concrete curbs were also built,

(Continued on next page)

C. & E. M. Photo

On the far side of this completed section of Bacon Siphon are the carpenter and steel yards where the concrete forms and reinforcing steel were processed. In the left background is the approach canal to the siphon.

IPCO UTILITY RAIN SUIT

Offers finest all-weather protection.

Absolutely waterproof and windproof . . Patterned roomy to be worn over regular clothing.

The IPCO Utility Rain Suit consists of coat, pants and detachable hood. Double texture fabric with a sheet of solid rubber vulcanized in between assures waterproof qualities. Olive drab color.

Write for Bulletin D-49

IPCO
Safety Equipment for all Industries
INDUSTRIAL PRODUCTS COMPANY
2855 N. FOURTH STREET • PHILADELPHIA 33, PA.

Amazing NEW DISCOVERY DEPTH-HARDENS ANY FERROUS METAL...in minutes!

Now anyone can harden steel tools and parts to any desired depth in minutes, with no more equipment than a plumber's torch or an open forge or furnace. Softest steels can be hardened to a degree hitherto obtainable only in steels of special manufacture.

...his Easy:

part to be hardened ...rge or furnace to ...r (1400° to 1700° F).

...ip, stir or roll object ...f Hi-Speed-It.

...from can, let it fuse ...seconds. Sprinkle with ...ly in Hi-Speed-It.

cherry red until is complete.

RESULTS ARE TRULY AMAZING!

Ordinary 20-penny nail hardened with *Hi-Speed-It* cuts nicks in chrome manganese railway rail... Unhardened rod of soft steel crumples against tough ¼" steel plate; *Hi-Speed-It* hardened rod is then hammered through. Chisel made by flattening one end of a concrete reinforcement rod, the softest kind of steel on the market, cuts notches in tough automobile spring leaf after *Hi-Speed-It* treatment!

FINE FOR HIGH SPEED TOOL STEEL

Hi-Speed-It produces extreme hardness in machine steel and high speed steels as well as soft steels. Application is same as for carbon steels except for use of higher heat and a second dip in *Hi-Speed-It* before quenching. Complete instructions printed clearly on every container.

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A couple of men, and their job—W. D. Connolly (right), assisted by L. E. Carpenter (left), superintended the construction of that big reinforced-concrete pipe in the background. Bacon Siphon, it's called, and it's for the USBR.

The 2,500,000 pounds of reinforcing steel that went into the siphon was cut and bent right on the job, in this steel yard set up by subcontractor Sparling. The Moto-Crane and gin-pole crane shown here handled the heavy steel pieces.

C. & E. M. Photos

Big Concrete Siphon On Irrigation Work

(*Continued from preceding page*)

at the contractor's expense, to hold the reinforcing steel steady. The outer curb was finished off about 6 inches wide and at the proper elevation to take the Type CC haunch bars. The inner curb was equipped with short lengths of ½-inch steel, doweled in the surface and spaced on 9-inch centers to conform to the inner and outer curtain steel.

Special Steel Forms Used

Wood forms were made up and used at the transitions and break points. But to pour all the regular sections of the siphon, a special set of inside and outside steel forms was used. It was designed by engineers of the Connolly Co. and made up to specifications by Western Pipe & Steel Co. of Los Angeles.

The outside form consisted of two shell sections mounted on rails and wheels. Hydraulic jacks on the frame permitted up and down movement. Each corner of this outside form was equipped with a Beebe hand winch to assist in moving the heavy piece ahead. On top of the outer form frame, built in such a way that it supported the open top and kept it from spreading, was a wooden pouring platform. Men worked from this point with concrete buggies when the forms were being filled.

The inside form—like the outer—was 24½ feet long. It was designed to ride along on top of a 53-foot-long lattice steel bridge which supported it from underneath. Conversely, when a pour was finished, the forms bolted through the concrete supported the steel bridge when jacks were released, and it could then be raised up slightly and rolled ahead so its front end lined up with the next pour.

A specially designed set of steel forms was used to pour the 23-inch walls—the outer form mounted on rails and wheels, the inner one on a steel bridge.

Hydraulic and screw jacks between the bridge and the inner form permitted the steel shell to be collapsed and expanded. When the forms were set up, they were checked carefully for alignment by a surveyor's plumb bob from the center line at each end of the form. Special attention, of course, was paid to the forward end.

In both the inner and outer forms there were three horizontal rows of bolt holes through which Richmond Tyscrus were inserted and tightened. Spreader jacks were placed across the bottom opening of the inside form to secure that form before the pour. The big forms were then so steady that they remained in place for the duration of a pour. The outside form was held steady on the timbers and rails under the wheels.

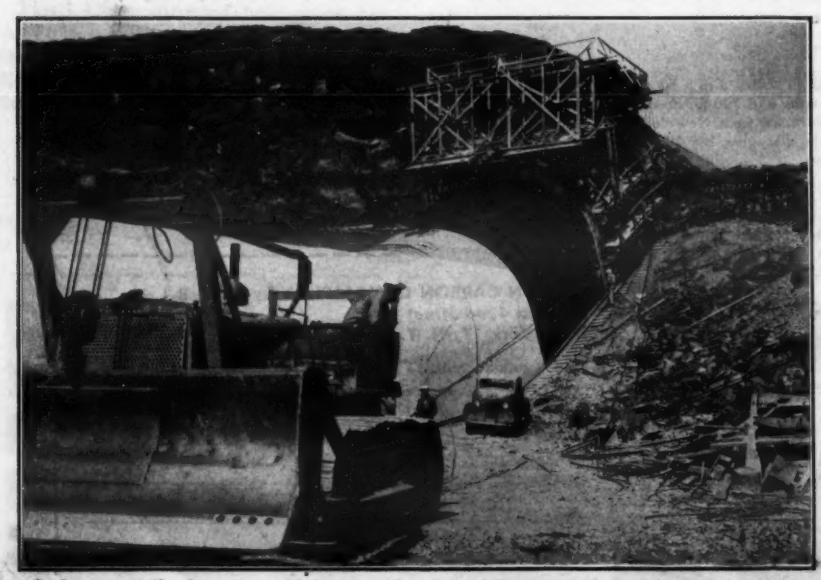
Elapsed time in breaking these forms loose and moving them ahead for the next pour ranged from 5 to 20 hours, depending on the local difficulties involved. It required close to 20 hours to move the rig ahead on a slope.

Transition forms and forms for the grade break points were fabricated of wood and lined with plywood. They were made up to full scale in the carpenter yard at the job, where power saws were readily available. When completed, they were cut down in sections and reassembled in place on the job. The steel bridge from the inside steel form was used to good advantage to support these wood forms.

Reinforcing Steel

Reinforcing steel for the siphon was one of the big steel jobs in the Pacific northwest last year. The 1,000-foot siphon called for over 2,500,000 pounds of reinforcing steel, much of it in large 1½-inch square sizes.

(*Continued on next page*)



Jacks moved the forms up and down, and on top of the outer form was a wooden platform to support men, concrete buggies, hoppers, and elephant trunks during a pour.

Bacon Siphon, part of the Columbia Basin irrigation project, will carry 6,600 cfs of irrigation water from the region near Coulee City, Wash., to lands farther south.

A subcontract was let to Sparling Steel Co. of Seattle, Wash., to fabricate and place this material. In order to handle it rapidly and efficiently, Sparling put a cutting and bending yard on the job site, only 200 feet away from the siphon.

Specifications called for solid welds on the curtain steel, to insure a solid ring. Long lengths of steel were practically impossible to buy, so Sparling used shorter lengths and made two welds on most of the rings.

Steel came to the yard by truck and was unloaded by a Lorain 41 Moto-Crane. From this point it passed through a regular assembly line. The curtain rings, for example, required the most work. First they were laid out in straight lengths on a worktable equipped with idlers. Here the pieces were cut to the proper length by a Kalamazoo metal-cutting saw. Then they passed on over to a heavy-duty bending machine powered by a 75-hp electric motor.

The bent sections passed automatically from the bender out to a large table and skids, where they slid down to the Federal electric-fuse welding machine which joined the ends together. Welds made with this machine checked out at 76,000 pounds of tensile strength on a 1½-inch bar, and passed the pull tests with flying colors.

As the hoops were made, they were picked up and stacked on another table by a gin-pole crane which consisted of a fir stiffleg with two H-beam booms. Hoist lines on the booms were controlled by Beebe and Budgit hoists. The booms easily picked up one of the 900-pound hoops and laid it over on the worktable.

On this job, the inner and outer curtain steel was assembled in the yard and tied together by short lengths of welded spacer steel. While this made extra work in the yard, it saved time when the sections were hoisted in place on the siphon. The Lorain truck crane set most of the steel, but on the grades its boom was too short. A Northwest 80-D—the same machine which poured concrete—placed the steel in these less accessible spots.

The curtain steel was also welded to spacer bars at the top. This procedure was especially effective on the slopes, because it did away with the usual headache of having to tie off the multi-ton overhang at these points.

Reinforcing-steel work had to roll right along, because the steel forms were so built that consecutive blocks, rather than alternate ones, had to be poured. Sparling's crews managed to stay well ahead of the concrete work at all times, using the methods and equipment already outlined. Studies made on the costs of fuse welding indicate, according to Bureau engineers, that alternate schemes will be presented in the future, allowing lap welds on the hoops.

Concrete Pouring

Most of the concrete pours averaged about 150 cubic yards apiece, and the big siphon barrel stripped out remarkably well. The concrete was dry-batched at a Johnson automatic plant near Coulee City, which also supplied material to two other contractors in the vicinity. Sand, aggregates, and bulk cement were furnished by the Government on this job, having been produced near by under another contract.

Batch trucks on the job included 3 Mack trucks which hauled three 1.1236-cubic-yard batches per load, and 2 Fords which hauled five batches of the same size. The cement was put into each batch through a special spout; thus it was somewhat segregated in the truck.

The dry batches were mixed at the pour by a Koehring 27-E paver, minus its boom and bucket. The concrete was mixed 1½ minutes, dumped into a Gar-Bro transfer bucket, and hoisted to a 4-compartment 4-way hopper on top of the pouring platform.

Four men with concrete buggies then took the concrete at that point, wheeled it over to hoppers, and dumped it. There were four access windows near the top of each form, and flexible elephant trunks led down into the barrel. There were four of these spouts on each side, and two down through the center to fill up the bottom of the barrel.

The bottom was poured and vibrated first, and special attention was directed towards making this base as dense and evenly distributed as possible. When the concrete had filled up to the spring lines, the inside steel form began to hold the concrete, and placing went right on up.

C. & E. M. Photo
Wooden forms for the transitions and break points in Bacon Siphon were built in this carpenter yard, then cut down in sections and reassembled in place on the job.

Four vibrator men were stationed on each side, far down in between the steel reinforcing. They had only 16 inches of working space. Ordinarily the men on top dropped about four buggies of concrete down each trunk at once. While

(Concluded on next page)

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Big Concrete Siphon On Irrigation Work

(*Continued from preceding page*)

the vibrator man was consolidating this material, they gave some other trunk a similar amount.

The top of the outer form was also open, and the concrete at this point was floated off to a good finish after it had been vibrated. Vibrators on the job included 8 Ingersoll-Rand pneumatic machines and four Malls.

The outside of the siphon barrel was cured with white-pigmented Hunt Process solution sprayed on at the rate of 150 square feet to the gallon.

Siphon to Be Backfilled

After the siphon was finished late last year, it was backfilled with excavated material from the Bacon Tunnel. This backfill was placed in the form of a dike, with a minimum cover of 3 feet over the top of the barrel. The flat top of the backfill is 27 feet wide, and side slopes are 1½ to 1.

Bacon Siphon and Tunnel represent only half the final development of the Columbia Basin project at this point. Identical siphons and tunnels will eventually lie side by side here, to double the present 6,600-cfs carrying capacity of the system. This will then be sufficient to irrigate 1,029,000 acres of good land lying towards the south.

Personnel

The job was designed and administered generally by L. N. McClellan, Chief Engineer of the U. S. Bureau of Reclamation, with H. A. Parker as Supervising Engineer.

For T. E. Connolly, Inc., the field work was directed personally by W. D. "Bill" Connolly of San Francisco. Mr. Connolly is the builder of many another tough tunnel project for private as well as government agencies.

L. H. Carpenter was the Assistant Superintendent, Barney Gardner was Siphon Superintendent, Mike Roych was Tunnel Superintendent, and the office force was composed of Comptroller Karl Buker and Accountant Earl Richardson.

Flame Thrower Has Blow-Torch Burners

A portable flame thrower is manufactured by the General Corp., Mercantile Bank Bldg., Dallas 1, Texas. The Killall burner operates on the same principle as a blow torch. It has no moving parts to wear out or to get out of order, the manufacturer states, and it is for use with either gasoline or kerosene as fuel.

The Killall unit is mounted on a wheelbarrow-type chassis and is designed for operation at a slow-walk speed, depending upon the material being burned. It has an all-metal 22-inch wheel with a 3-inch tread. The burner has four elements equipped with ⅛-inch brass jets. The flame guard is made from 20-gage sheet iron. The Killall unit when crated measures 18 x 25 x 48 inches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 63.

The Story of Wood Decay

A 4-page bulletin about the causes and prevention of wood decay has been prepared by the Chapman Chemical Co., Dermon Bldg., Memphis 3, Tenn. Titled "Protecting Your Investment in Wood", this brochure describes how fungi attack wood, how various conditions aid the growth of these fungi, and how the Chapman preservative penetrates the wood pores and prevents the growth of these wood-rotting fungi.

The Chapman preservative is a chemical compound whose principal ingredient is pentachlorophenol—a substance said to be especially poisonous to wood fungi. The catalog describes this preservative and shows three methods for applying it—by hot and cold baths, cold soaking, and brushing and swabbing. The folder also describes the three concentrations in which the material is packed, and the size of container in which each is shipped.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 17.

Power Pipe Threader

A powered, portable pipe threader is announced by the Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, Ill. The Model No. 165 pipe threader is designed for operation in conjunction with any standard ½-inch electric drill. It will handle 1, 1¼, 1½, or 2-inch pipe with one set of high-speed steel chasers. The threader is furnished complete with one set of chasers and a drive adapter, and it has a total weight of 26 pounds.

The Armstrong Model No. 165 powered pipe threader is designed for operation in conjunction with any standard ½-inch electric drill.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 4.

Sisco Is Research Head

Frank T. Sisco is the new Technical Director of the Engineering Foundation, which sponsors and supports fundamental research in all fields of engineering. It is a joint research agency of the four major engineering societies. Mr. Sisco will also continue as Director of Alloys of Iron Research, a position he has held in the Foundation since 1930.

Teeth on Bulldozer Serve for Scarifying

Scarifier teeth for use in conjunction with a bulldozer blade are manufactured by the Small Equipment Co., 916 N. La Cienega Blvd., Los Angeles 46, Calif. The Back-Rip scarifier consists of hinged teeth mounted in a housing welded to the back of the blade. These teeth are designed to dig into the ground when the tractor is moving backward with the blade floating or close to the ground. A hinged joint permits them to drag freely when the blade is pushing forward. A lock pin holds them in the raised position when they are not being used.

Back-Rip teeth help provide full loads with each pass of the blade even in hardest soils, says the company. If the ground is loosened and scarified on the back trip, the manufacturer points out, it is unnecessary to use two pieces of equipment or waste time attaching an accessory to the tractor. The system also permits a reduction in non-productive time, as it is not necessary for one operator or piece of equipment to wait for the other to complete its task.

Welded to the back of a bulldozer blade, the Back-Rip hinged scarifier teeth dig into the ground when the tractor is moving backward with the blade floating or close to the ground.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 86.

Parrish Retires from I-H

W. M. Parrish has retired after more than 24 years of service with the International Harvester Co. He was Assistant Sales Manager, Manufacturers' Sales, of the Industrial Power Division of the company.

Construction Expert Sees Costs Stabilizing

A stabilization of construction costs is foreseen by J. P. H. Perry, Vice President of the Turner Construction Co. Speaking on construction trends at a meeting of the Delaware sub-section of the Philadelphia Section of the American Society of Civil Engineers, Mr. Perry said that construction costs appear to be stabilizing and that there are few items which are still subject to escalation—the principal one being steel. He also stated that the trend of construction in this country, so far as quality and volume are concerned, is definitely upward.

Mr. Perry pointed out, however, that further wage increases and more Government controls could cause higher costs, and that "there are few elements which would lead us to believe that costs will decline materially". He feels that the cost trend, in general, will vary 5 per cent up or down from today's price level, although if economic conditions continue in their present direction, there could be a drop of as much as 10 per cent before the end of 1949.

"There will probably be less work authorized or started in 1949," Mr. Perry said, but "the implications are that public work—municipal, state, county, and Federal—will probably show an increase." He feels that industrial work and home building will probably decrease, and that the Government's proposed labor legislation will affect adversely the volume of construction in 1949.

Mr. Perry believes that there will be a reasonably adequate supply of material and equipment and man-power, although the latter is still somewhat lacking in efficiency. The availability of material will be affected by shipments to foreign countries, as well as by a possible Governmental allocation of materials which might be occasioned either by a subsidized home-building program or by a rapid step-up in defense expenditures.

"For the longer pull, say up to five years, there are few elements which would lead us to believe that costs will decline materially. Of course, a war or a great depression would upset any current thinking . . . [but] even if the prophets of gloom are right, and an economic bust is around the corner, there are those who believe that a great public construction program of both buildings and heavy work would be gotten under way with a resulting nearly full employment of construction workers and the creation of a wider market for building materials—all factors tending to keep construction costs up."

Mr. Perry further declared: "should our Government tend to become more and more liberal and veer towards a socialistic state, the effect on building costs would probably be to push them up rather than down. Government operation is notoriously inefficient and costly. Bureaucratic management is seldom economical. Allocations and controls of materials and of their distribution tend to increase costs if in no other way than by creating expensive black or gray markets."

Two Groups Join the AGC

Two new chapters have been added to The Associated General Contractors of America, Inc. A highway and heavy chapter has been created in Louisiana, and a similar chapter has been set up in Michigan.

The Michigan group consists of the 106 members of the Michigan Road Builders' Association who voted to affiliate with the AGC.

The Louisiana organization has statewide coverage and will be known as the Louisiana Highway & Heavy Construction Branch, AGC. Headquarters are in Baton Rouge.

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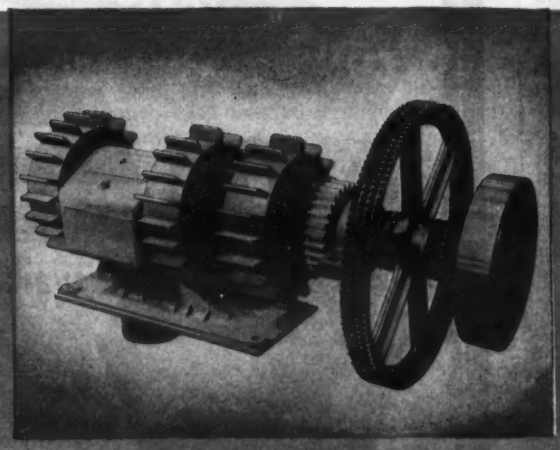

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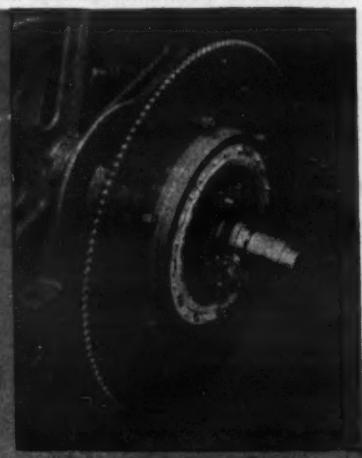

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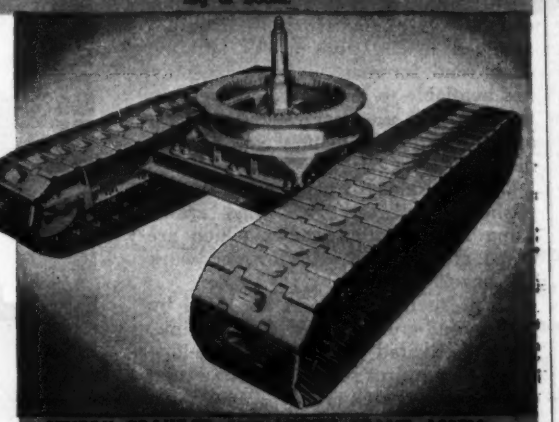
READILY CONVERTIBLE—from one front end to another.

These and many more desirable features make the MARION 33-M a fast, powerful, dependable and economical machine.



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Mushrooming County Has Roads to Match

Fastest-Growing County In Nation Has 4,000-Mile Highway System to Keep In Good Shape

✦ IN the past decade, the city of Los Angeles, Calif., and its environs have grown faster than any other community in the nation, according to Mayor Fletcher Bowron. Population has skyrocketed. Problems in human relations are on the increase. Big-city and big-county government now rules what was once a sleepy Spanish village.

One of the very first places where a community's growing pains reflect themselves is in its highway system. Los Angeles County is an exception only in the manner in which it has set about to solve its highway dilemma. It certainly has typical problems.

Today, highway maintenance in Los Angeles County is big business. Some 4,483 miles of roads, mostly high-grade hard-surfaced highways, crisscross the county. Over 900 men work the year round to keep this system in shape. In addition, prisoners in nine detention camps are assigned to county road maintenance. The budget for maintenance is equal to what some state highway departments spend for the same activity.

Problems have been solved only because Los Angeles County has mechanized its operations as rapidly as possible. While some of the work like temporary patching, for example, is still done by hand because machines have not been developed, almost all road maintenance activities are 100 per cent mechanical.

The Organization

Community activities of Los Angeles County are governed generally by a five-man Board of Supervisors. Highway activities come under the supervision of O. F. Cooley, Road Commissioner, who is responsible to the Board of Supervisors. E. A. Burt is his Chief Deputy.

Under these men come the various highway departments: Maintenance, Construction, Right-of-Way, Bridges, Traffic, Accounting, and Miscellaneous.

The maintenance organization is headed by W. W. Shelby, County Road Maintenance Engineer. He has an assistant engineer, a secretary, and a stenographer at his headquarters office in the Higgins Building in downtown Los Angeles. District offices, under jurisdiction of a district engineer and assistant, are located in Compton, Baldwin Park, Altadena, Palmdale, Santa Monica Mountains-West Hollywood, and the detention camps.

The various districts are subdivided further. Compton, for example, has a warehouse crew, 9 road-division foremen, 2 construction crews, 4 paved-road crews, operators for 7 power sweepers, and a miscellaneous gang.

Unusual Organization Chart

One of the most unusual and up-to-date organizational "bluebooks"—and that is what they call it—has been compiled by Mr. Shelby, with the help of the district engineers and some of the foremen. In loose-leaf form, it lists the entire maintenance organization, arranged by districts. Because this book represents so many hours in the field, and such a thorough study of the field job, foremen generally respect it.

The bluebook contains a section on each district which shows the fundamentals of organization in that district. It includes a complete breakdown of crews by title and salary, indicating the optimum number of men for best performance. And it shows each unit of equipment. The equipment section is so arranged that it can be reviewed each year, the older units sold, and new units purchased.

The number of pages allocated to each district is different, because the districts differ from one another. Los Angeles County has everything from the maintenance of streets in subdivisions to the upkeep of ranch roads far back in Antelope Valley. It has some roads at sea level, and it keeps four rotary snow plows busy in the winter on some of its mountain highways above the snow line in the Sierra Madres.

The organization bluebook is used as a reference bible when it comes to keeping the number of men in crews in line and distributing equipment. Insofar as possible—and it goes a long way towards acomplishing its objective—it is a study of the job each district has to do and of the proper crews and equipment to do that job.

Take the fundamental organization of the Compton District, for example. Compton is set down on a flat flood plain surrounded by a mushrooming population. Subdivisions are everywhere. The principal job here is street maintenance, but those streets range from 4-lane highways to low-type streets through residential areas.

Here is what the bluebook has to say about the basic Compton organization:

1. Each road foreman has a permanent crew as well as a certain number of equipment units which are definitely assigned to the division. In addition, each road foreman without exception has available to him one or more units together with their corresponding operators, who alternate between adjacent districts.

2. All permanent patching is accomplished by three paved-road crews, using 10 integrated trucks which are based at warehouses and which work "at large".

3. All "permit" repairs are done by paved-road crews. At the present time, under activated subdivision developments, it requires something more than one standard patch crew.

4. Six large power sweepers and one small sweeper operate in the Compton area. The cleaning schedule also includes the operations of two trash crews which are for the purpose of hand-cleaning roadside dumping.

5. Two construction crews handle all of the pre-mixing and a portion of the construction projects. The remainder of the construction projects are assigned to the individual road foremen, using their own equipment and that which alternates between road divisions on an "as needed" basis.

6. A paint crew, based at the Compton warehouse, is assigned to paint bar-

(*Continued on next page*)

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featuring....
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  positive Locking Automatic Hitch

GOOD ROADS MACHINERY CORP. MINERVA, OHIO

C. & E. M. Photos
At left, Compton District Engineer Templin inspects one of the special bituminous patch trucks used by road-patching crews. Above, a workman spray-paints some barricade signs in the Compton District yard.

ricades, guard fences, etc., throughout the entire Compton district. The equipment consists of a sand-blasting unit and a paint spray, mounted on a 1½-ton truck. The crew consists of a truck driver and a painter.

7. Two weed-sterilization crews, based at the Compton warehouse, work at large on weed control during the rainy season. No extra personnel is needed for this operation.

Compton District Work

Some 1,400 miles of highways are in the Compton district alone. Space does not permit detailing the operations of each district, but the way the jobs are scheduled and done at Compton is typical of the other districts. The work differs only in its nature, and in the topographical environment.

The backbone of all maintenance operations at Compton, as in some of the other districts as well, is the large-scale bituminous pre-mix work which is carried on for a period of about 100 days in July, August, September, and October. This work is actually started about six months before the first pre-mix hits the first job. For during the winter months, District Engineer N. H. Templin and his Compton staff are busy making a rather broad analysis of the work ahead.

Pre-mix work consists of resurfacing old bituminous or macadam roads with hot-mix made with SC-6 oil instead of asphaltic cement. This material is trucked to the job and dumped by the contractors who supply the material, and bladed smooth by motor patrol graders of the County Road Department. The material is laid down usually at the rate of from 12 to 24 pounds per square foot.

Pre-mix work is designed to head off damage before it actually occurs, thereby protecting the original investment. Patching of holes is also done, but only as a temporary expedient until the pre-mix crews can come along. Two patch crews take care of 1,400 miles in the Compton district, so well do the pre-mix and sealing crews do their work.

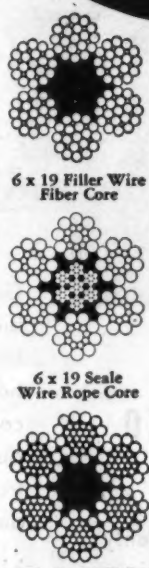
At any rate, Templin and his men start working in December on the next summer's work. Estimates are made up as to the number of pre-mix jobs which must be done the following summer. The jobs are programmed and scheduled by dates, and estimates as to the tons of pre-mix required are then sent in to Mr. Shelby's office. At Compton, the requirements in 1948 ran 600 tons per day for a 100-day period.

Bids are then asked, and commercial hot plants around Los Angeles bid competitively for the work. No plant is allowed to bid beyond its capacity to produce, and deliveries from the low bidder are carefully scheduled. Last year, for example, Graham Brothers was low bidder in three districts. The jobs were so arranged that only one district drew on Graham Brothers plant at a time.

Pre-mix operations in the field are relatively simple. An Etnyre pressure distributor moves in first with a fine mist-like tack shot of SC-6, if the pre-mix is going on old pavement. Trucks from the pre-mix supplier then come in to the job where a dump man directs the dumping of material. A motor grader then spreads the hot-mixed material to exact grade. After being laid, the spread material is rolled by smooth-wheel rollers.

State highway engineers sometimes say that it is impossible to spread No. 4 rock with a motor grader, but Los Angeles County operators do it regularly. The reason is that they have become proficient, over a long period of time, in the operation of the machines. In the Los Angeles County set-up, an equipment operator is the dean of workmen. When a man gets to be an operator un-

(Continued on next page)


6 x 19 Filler Wire Fiber Core
6 x 19 Seale Wire Rope Core
Style G-Flattened Strand Fiber Core
6 x 37 Filler Wire Fiber Core
6 x 41 Wire Rope Core

"HERCULES" (Red-Strand) Wire Rope has proved its worth by the accurate yardstick of actual performance. For over 60 years the Red-Strand has been a dependable guide to safe and economical wire rope service. Now in the Preformed type, a plus value has been added. As internal stresses are largely eliminated, the rope is less apt to kink . . . it is easier to handle . . . it spools better. But these are not the only advantages. Because internal stresses have been reduced there is less internal wear and more resistance to bending fatigue, which means longer life.

Another and an ever important factor in determining wire rope life is the use of the right construction for the work the rope is to do. To meet this situation, Preformed "HERCULES" (Red-Strand) Wire Rope is made in a wide range of both Round Strand and Flattened Strand constructions. There is a correct type for any heavy duty job. Our Engineering Department will be glad to help you make the right selection.

We invite your inquiries.

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.
ESTABLISHED 1857
5909 KENNERLY AVENUE • ST. LOUIS 12, MISSOURI
NEW YORK 6 • CHICAGO 7 • HOUSTON 3 • DENVER 2
LOS ANGELES 21 • SAN FRANCISCO 7 • PORTLAND 9 • SEATTLE 4

Mushrooming County Has Roads to Match

(*Continued from preceding page*)

der the Civil Service rules of the County, he stays on.

Statistics on pre-mix assembled during the 1948 season showed a price per ton of from $2.70 to $3.18, with an average of $2.95. Total cost of material per square yard was $1.91, $2.71, $3.20, and $4.02 for 12, 15, 18, and 24 pounds per square foot, respectively. The labor and equipment cost of placing the material averaged about 10 per cent of the total unit price.

Three general types of pre-mix are used: coarse, medium, and fine. The various mixes are made to rigid specifications by passing the ingredients through standard commercial hot plants. Details of the mix components are as follows:

Coarse Mix

Sieve Size	Minimum Passing	Maximum Passing	Ideal
1¼-inch	100	....	....
1-inch	95	100	100
¾-inch	75	95	85
½-inch	60	70	65
¼-inch	35	45	40
No. 4	22	28	25
SC-6	4 per cent	6 per cent	4½ per cent

Medium Mix

1-inch	100	....	....
¾-inch	95	100	100
½-inch	75	95	85
¼-inch	40	60	50
No. 10	22	28	25
SC-6	4 per cent	6 per cent	4½ per cent

Fine Mix

¾-inch	100	....	....
½-inch	95	100	100
¼-inch	45	65	55
No. 10	22	28	25
SC-6	4 per cent	6 per cent	4½ per cent

The fine mix is usually selected when the cover coat is to be thin, and the coarser mixes are used where a thicker layer is to be put on.

Special pre-mix jobs also are done in many of the subdivisions. Because a portion of the country is low and swampy, drainage in such areas is a tough problem. Every intersection presents a new difficulty. The intersections often show a tendency to fail first because of drain water which runs even in summer, when the residents sprinkle their lawns.

Regular pre-mix would not stick on wet surfaces, and after a short time it raveled out. But pre-mix patching is now staying put because the maintenance men are putting 4 gallons of an additive to the 400-gallon oil tank which is used for the patch work. A great deal of penetration-macadam patchwork at intersections is also done by this method, and the additive is working excellently to hold the patch from raveling, according to District Engineer N. H. Templin at Compton.

The general variety of pre-mix job conditions is great. The first asphalt roads were laid in Los Angeles County many years ago. Many are over 25 years old. In the early days they were laid down on graded earth, regardless of whether it was sand, clay, or gumbo. Sub-bases were unheard of. Later, as traffic increased, these oiled surfaces were thickened with penetration macadam. The work now gives more thickness to that old macadam. A typical street today may have ½ inch of road oil, an inch of macadam, and 2 inches of pre-mix, built up in that order over the years—in other words, progressive construction.

Seal-Coat Work

Another activity is the sealing of bituminous pavements to give their tops new life and to block out moisture. Lately some excellent results have been obtained with General Petroleum's HV emulsion, applied at the rate of 0.5 gallon per square yard and covered with from 1 to 2 pounds of cover chips per square foot. This emulsion forms a jelly soon after hitting the road; it breaks in a short time, and it holds the rock.

C. & E. M. Photo

This seal-coat crew is busy laying a seal and armor coat across the top of a temporary bridge detour under the jurisdiction of the Compton District.

Asphaltic-concrete highways which have cracked because of sugbrade failure and earthquake action have been successfully patched with this emulsion. The cracks are painted just the way cracks in a concrete highway are filled—by hand.

SC-6 oil is also used to a great extent on seal-coat work. On a 136,500-square-yard job last summer, the final report showed that 27,350 gallons of SC-6 was used, along with 975 tons of cover chips. The job required 32½ days of equipment rental and 91¾ man-days. Final unit cost was about 4 cents per square yard, and the road will be good for about 4 years without further attention.

Fast trucks haul oil out to the jobs from the Compton warehouse yard. In this yard there are two 25,000-gallon storage tanks for SC-0 and SC-1 priming oil, and a 25,000-gallon tank for SC-6. There is a 2,000-gallon overhead "ready" tank, which can fill a tanker by gravity, and a 2,500-gallon temporary storage tank. Two gas-fired retorts heat the oil to application temperature.

The County has three of the latest-model Etnyre distributors, mounted on International and Brockway trucks. One of the big distributors will haul 2,000 gallons.

Weed Sterilization

Twenty years ago, it was customary to hire large crews of men, especially during the rainy season, to control the weeds along the right-of-ways. Devil grass, puncture vine, dock, sweet anise, and other weeds were then quite prevalent, and often grew up so high at turns in the roads that motorists could hardly

(*Continued on next page*)

2 twinbatch* sizes . .

34-E

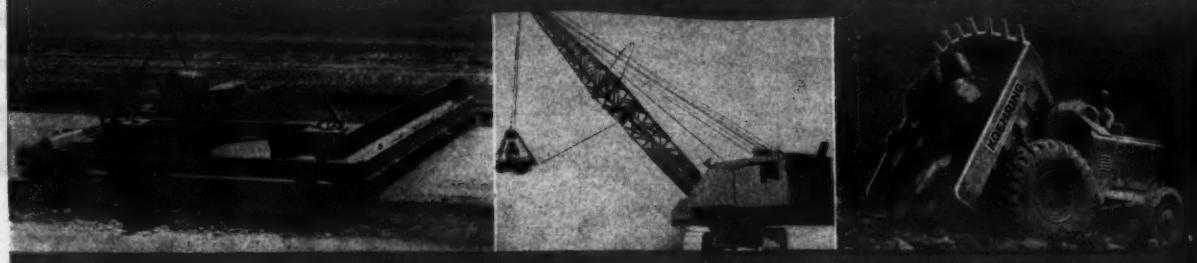
mixes up to 90 batches per hour. . .

Koehring 34-E *twinbatch* Paver has plenty of reserve operating speed to keep your big-production paving jobs on schedule . . . can hit top output of 90 batches per hour, depending on engineer specifications and job conditions.

Gains valuable seconds every batch, because big 10'-wide skip hoists in only 8 seconds . . . large throat discharges almost complete load before skip is in elevated position. Positive air control by Batchmeter actuates transfer and discharge chutes . . . saves more seconds. Paver travels by power as skip raises . . . double-door boom bucket dumps full batch instantly . . . at any point along boom.

Full accessibility of every maintenance point on the Koehring heavy-duty 34-E *twinbatch* protects your profits against costly down-time . . . keeps production on schedule.

SAVE TIME, MONEY with COMPLETE KOEHRING HEAVY-DUTY LINE



LONGITUDINAL FINISHER . . . CLAMSHELL CRANES . . . HIGH-SPEED DUMPTOR* .

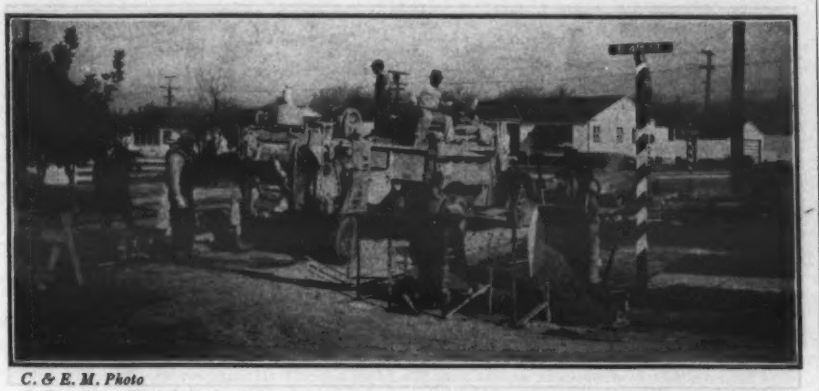
see at all.

The hand method gave way some years ago to mowers, but even these have been largely replaced by chemical control. This is the job of the sterilization crews.

To kill sweet anise and dock, 2, 4-D is used extensively and is very effective. The devil grass, which often grows right up through 6 inches of pavement, is something else. For this stubborn weed, and also for puncture vine, ground sterilization is the only remedy.

The chemicals for this work are made up in the Compton yard—and in the other district yards for work there. About 200 pounds of sodium chlorate is added to 400 gallons of a sodium metaborate solution, and mixed. The sodium metaborate reduces the fire hazard of the chlorate to a point where the grass will burn normally, as it would if it were dry. The intent is not to fireproof the solution completely, because the cost would then be prohibitive.

The chemical solution is applied to the grass by a gravity sprinkler truck. Where the grass occurs in small, irregular patches, the solution is not used, because there would be too much waste. The sodium chlorate is sprinkled dry over the small patch, and winter rains and fog dissolve it to accomplish the desired objective.



C. & E. M. Photo

A Compton District concrete crew pours a curb along a street in a residential section. At left, wearing an overcoat, is District Engineer N. H. Templin.

Results with chemicals seem to be so permanent that the sterilization crews are now rapidly catching up with the roadsides. "When they have to go out and hunt work to do, we'll know the weeds are definitely under control," said District Engineer Templin.

There have been times in the past when some of the weeds got out of control. In such cases alternate 100-foot spots were sprayed with diesel fuel, and the places were then set afire a few days later. The alternate un-sprayed spots were then sprayed and burned.

The ground around 6,000 traffic-control signs has now been largely sterilized so that weeds cannot obliterate them as they did in the past.

Special Trucks for Patching

While bituminous patching is regarded as a temporary expedient to stop holes for the time being, the County has developed some special patch trucks which would do credit to a full-time operation. The trucks are designed to be self-sufficient. Crew, tools, oil, and aggregate all ride in the same vehicle, and the vehicle has a powerful enough engine to step out and go.

The rigs consist of big Mack trucks with wide, long beds capable of hauling 12 tons of aggregate or pre-mix. Between this bed and the truck cab is a 300-gallon asphalt tank, covered with 4 inches of insulation. The exhaust from the engine passes through a U-shaped tube inside the tank. Spigots on each side of the truck permit the hot asphalt to be taken out by hose. The insulation on these asphalt tanks is so effective that the temperature of the oil builds up somewhat after the vehicles leave the yard.

The cab of the truck is big enough to accommodate the entire crew: foreman, truck driver, and four men. There are several steel toolboxes welded to the truck frame all around, to hold the tools these men need to make an asphalt patch.

These special trucks, which have done away with the old method of dragging hot pots behind a dump truck, work very efficiently on almost any type of patching. Where asphalt material is being filled in against roadside edges, a crew can haul and distribute about two full 12-ton loads in a day.

Sweeping

It may seem strange to many a rural-county maintenance engineer that street sweeping is a regular activity in the Compton district, but such is the case. A dirty street results in a deluge of letters and telephone calls. The people demand clean streets, regardless of cost.

In the Compton district alone there are seven sweepers, which cost approximately $105,000 a year to operate. And at the present time these seven appear to be not quite enough. The sweepers begin operating in the early morning hours, usually around 2 a. m., to take advantage of the lull in traffic. There are several business districts of small towns throughout the county which have to be swept at least twice a week.

Sweeping up against a curb is one of the main problems, but modern sweepers are now overcoming the limitations of earlier models.

Equipment Repair

Each district has its own equipment-repair shop where lathes, bench grinders, hydraulic presses, and various small machine tools are located. Each shop also has a stock of repair parts for the equipment, so that down time can be kept to a minimum. Equipment of the County Road Department and units assigned to the Bridge Maintenance Division are all repaired in these shops.

To give some idea of the magnitude of this repair job, the Compton District alone operates 51 trucks of 1½-ton capacity, 6 pick-up trucks, 7 patch trucks of 10-ton capacity, 3 pressure distributors, 9 automobiles, 12 power sweepers (7 actually at work in the field), 16 motor patrol graders, 13 tractor loaders, 16 rollers, and 13 pull brooms.

Other Operations

Los Angeles County road engineers

(Concluded on next page)

to fit *all* your paving jobs

new rubber-tired 16-E *twinbatch*

- Koehring 16-E *twinbatch* gives you 60° elevating boom . . . discharges bucket at 21' height.
- Mixes up to 50 cu. yds. per hour (based on 60-second specifications).
- Travels on 6 (11 x 20) pneumatic tires.
- Moves job-to-job at speeds to 8.1 m.p.h.
- Charges fast . . . has 7-second skip hoist.
- Has all the exclusive operating features of bigger Koehring 34-E *twinbatch* Paver, including: split-second Autocycle mixing controlled by Batchmeter . . . accurate syphon-type water tank for consistent, maximum-strength concrete.

KOEHRING HEAVY DUTY

KOEHRING COMPANY Milwaukee 10, Wis.

Subsidiaries: KWIK-MIX PARSONS JOHNSON

Mushrooming County Has Roads to Match

(*Continued from preceding page*)

also supervise the work of county prisoners in nine detention camps. Prisoners consider it a privilege to be assigned to these honor camps, and there are few instances where men have escaped.

While they are at these camps, the prisoners are paid 50 cents per day. They are well fed, and are under the general supervision of the County Sheriff's Department. They work within a reasonable radius of each camp, building and maintaining roads. Actual road work in the field is carried on under the direction of a resident engineer from the County Road Department.

Road maintenance in Los Angeles County runs the widest possible range for an organization which is largely metropolitan. There are some county roads in desert country where a motorist can travel for miles without seeing a sign of habitation.

The head of this big organization is O. F. Cooley, County Road Commissioner, who makes his headquarters in Los Angeles in the same building where Maintenance Engineer Shelby is located.

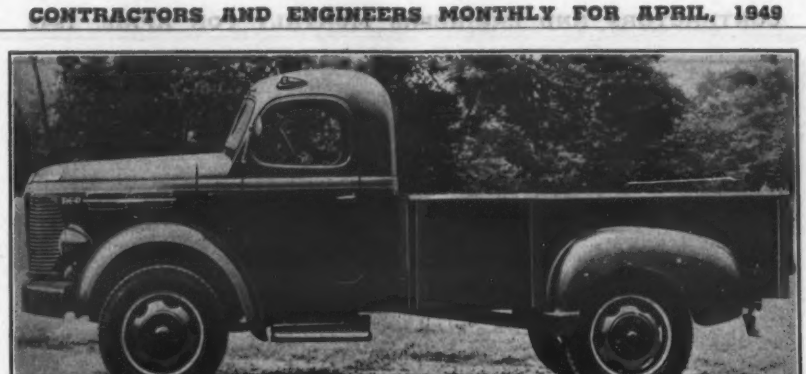
By compiling the bluebook, by mechanizing as many of the maintenance operations as possible, by developing specialized equipment such as the patch trucks, and by keeping a close check on routine work, these men and their organization have just about reached a solution to the vast problem of maintaining county roads in the country's fastest-growing county.

Magnet for Road Sweeping

A bulletin describing the new Dings high-intensity road-sweeping magnet is available from the Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14, Wis. This magnet is designed for truck mounting, and is operated by a portable engine-generator set.

The bulletin illustrates the magnet, shows it installed on a truck, and tells how it can be used to pick up nails, spikes, and other metal objects from dirt or paved surfaces.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 19.



The new Model D-19X Speed Wagon announced by Reo Motors, Inc., has a 2-ton capacity and is designed for rugged service.

Trucks in 6 Models Are Added to Line

A pick-up truck with a load-carrying capacity of 2 tons has been placed in production by Reo Motors, Inc., Lansing 20, Mich. The D-19X heavy-duty Speed Wagon is powered by a 245-cubic-inch Reo-built Gold Crown truck engine and it has a gross vehicle weight of 8,000 pounds. Among the features claimed for it are heavy frame construction, large clutch plates and braking areas, and a heavy-duty transmission.

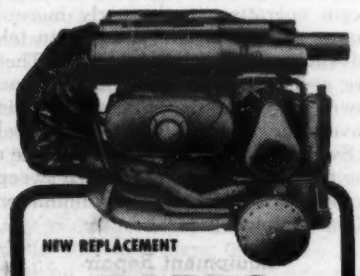
Reo announces at the same time that five new combinations have been added in the D-23 series of trucks, ranging in gross vehicle weights from 21,000 to 56,000 pounds. They are powered by 371-cubic-inch valve-in-head engines. Hydraulic brakes with reserve tank and 9:00 x 20 tires are standard, with full air brakes and 10:00 x 20 tires optional. Single-reduction rear axle is standard, with double-reduction and 2-speed axles optional.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 125.

Consultant for Blaw-Knox

H. C. Peters has been named Technical Consultant of Construction Equipment for the Blaw-Knox Division of the Blaw-Knox Co. He will make his headquarters at the home office in Pittsburgh.

Mr. Peters has been associated with the T. L. Smith Co., Ransome Concrete Machinery Co., and the Truck Mixer Manufacturers Bureau.



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• Thousands of these war-surplus portable heaters, made by Stewart-Warner, have now served contractors through the toughest winter in U. S. history. It's time for repair . . . tune-up . . . overhaul! We have nation's largest stock of new, factory made parts. Also expert, trained mechanics who know these heaters from A to Z. Servicing now insures good supply of parts, best work, top performance next winter. Write us now for parts list. Ship heaters direct to our shop for service. All work guaranteed.

MORE HEATERS NOW AVAILABLE!

Price: Used, $195. New, $295. Originally cost Gov't. about $600.

ENNIS SUPPLY CO.

334-1st St. No. Dept. G
Minneapolis, Minn.

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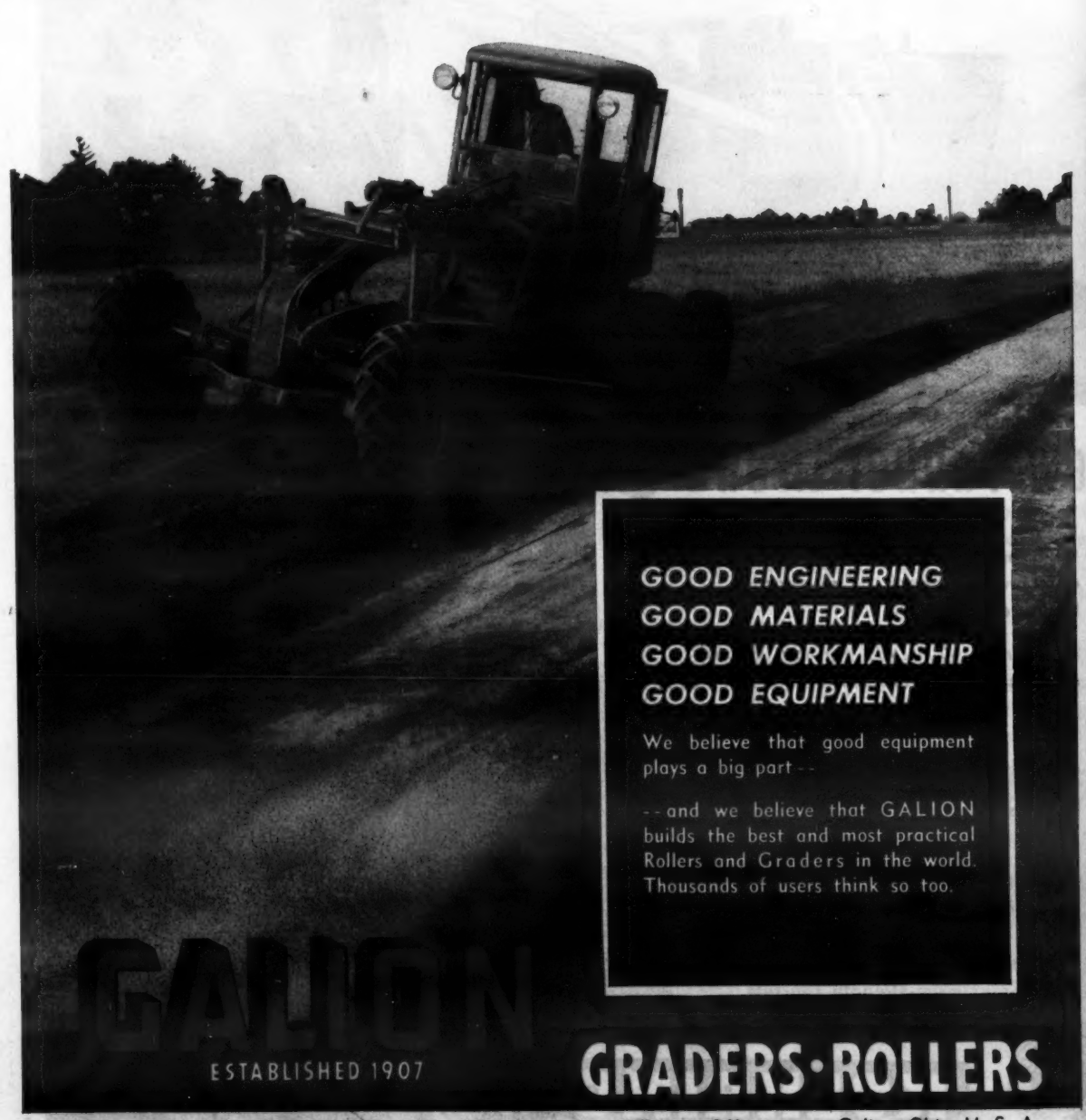

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GOOD MATERIALS
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Fluorescent Lights For Bridges, Roads

Fluorescent lighting for bridges and roads is being tested by engineers of Sylvania Electric Products, Inc. The test is underway on a 500-foot section of Kernwood Bridge between Salem and Beverly, Mass., and is being made in cooperation with the Essex County Commissioners and the Salem Electric Light Co.

The installation consists of a row of 8-foot fluorescent lamps mounted on a fence rail along one side of the bridge. The rail is 5 feet above the bridge deck. A louver on the fixture shields the lamp from the eyes of the motorist. Specular reflectors throw the light across the 32-foot road, and motorists can drive through the area without using headlights.

The system is designed to take advantage of the diffuse light which fluorescent lamps give, and the high level of vertical illumination produced by cross-lighting. The engineers conducting the test believe that this vertical illumination makes such a system safer for driving because of direct object brightness. Also, the low mounting heights permit bridge designs without the use of lampposts.

Variety of Speeds With New Gear Unit

A new 4-speed transmission is announced by the Fuller Mfg. Co., Kalamazoo 13F, Mich. The Model 4-A-112 is for both on and off-highway applications where a high percentage of operation is required through gears in conjunction with auxiliaries. It is especially recommended by the company for use on earth-moving machinery.

When used in combination with a 3-speed auxiliary transmission, the Model 4-A-112 is said to provide 12 forward and 3 reverse speeds. When used with a 2-speed auxiliary, it provides 8 forward and 2 reverse speeds. The Model 4-A-112 also offers a wide range of ratios, with optional second and reverse speeds.

As a special feature, the Fuller transmission uses helical gearing in all four forward speeds. The helical gears are engaged by sliding jaw clutches and permit easy shifting, says Fuller. Extra-heavy bearings are used throughout.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 2.

One-Use Rock Bits

Rock-drill bits designed to be used once and then discarded are made by the Throwaway Bit Corp., 4200 N. W. Yeon Ave., Portland, Oreg. They have two main advantages in addition to economy, the manufacturer points out:

Fluorescent lamps mounted on a fence rail 5 feet above the deck of this Massachusetts bridge are responsible for the light diffused across the width of the road.

(1) since they have plenty of edge to cut themselves out when they hit mud seams, stuck drill steels are rare; and (2) the bits are finished with small, flat surfaces on four sides, to provide a total of eight cutting edges.

Complete details on the use of the bits and the correct way to handle them are contained in an instruction sheet available from the company. This sheet tells how to machine, normalize, and harden the steel to which the bits are to be attached; how to secure the bit on the rod; and also how to remove it after use without hurting the drill steel.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 20.

Barco Ups L. P. Oelschlager

L. P. Oelschlager has been appointed Assistant Sales Manager of the Gasoline Hammer Division of the Barco Mfg. Co. He has been with the company since 1937.

VERSATILE ALL-PURPOSE BLADE

The Danuser Blade attachment for popular makes of tractors is ideal for terracing, landscaping, and light dressing operations. This versatile blade has won wide acceptance and is easily controlled by tractor operator. Write for literature to Dept. D.

DANUSER MACHINE CO., Fulton, Mo.

also manufacturers of famous Danuser Digger

DANUSER ALL PURPOSE BLADE

Grand Slam

in bridge building

with TL-20 CRANEPOWER

Goodwyn & Murphree, Troy, Alabama, own 4 Lorains . . .
"trump" construction costs on bridge job with 1 Lorain TL-20 Crane

Here's how Goodwyn & Murphree made a "Grand Slam contract" on a bridge building job near Red Bay, Alabama.

Leading with a TL-20, one of four company-owned Lorains, the contractors "finessed" every operation and "trumped" construction costs on every count with this power-packed, versatile machine and its various crane attachments.

Tricks taken by the TL-20 as shown by the photos—top left: TL-20 crane, equipped with 1250 lb. drop hammer, drives 75 ten-inch piles to 10 ft. depth in 10 hr. day for two cofferdams below water level. Top right: Swinging the concrete mixer into place. Center: Pouring concrete into forms. Bottom right: Working as a dragline to dig foundation for a concrete form.

This is one of hundreds of construction jobs where the TL-20 is taking extra tricks in production with its labor-saving selection of boom equipment and choice of either crawler or rubber-tire mountings. For this peppy, multi-purpose machine provides over 50 possible combinations to fit your job conditions . . . a full "deck of aces" for a profitable operation. Let your Thew-Lorain Distributor deal you all the facts on this money-making machine—today!

THE THEW SHOVEL CO.
LORAIN, OHIO

Lorain®

Thew Lorain TL-20

The design of Sturdie scaffold clamps enables them to grab the pipe anywhere along its length, eliminating the need for cutting pipe to exact size.

Clamps Speed Placing Of Pipe Scaffolding

Clamps for use with tubular scaffolding are manufactured by the Leonard Malone Co., 342 Madison Ave., New York 17, N. Y. The construction of these clamps permits them to grab the pipe anywhere along its length; this eliminates the need for cutting pipe to exact size. A special male-and-female connector is available for butting the pipe when vertical heights exceed the length of the pipe.

The Sturdie drop-forged scaffold clamps are for use with standard 1½ inch pipe which has an outside diameter of 2 inches. Scaffolds can be erected to any size with these clamps, but the spacing of posts or uprights will depend upon the weight to be carried. Large-size clamps are also available for drill carriages and jumbos in tunnel work.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 64.

Protective Coatings For Metal Surfaces

A protective-coating system for use on all types of metal is announced by the C. A. Woolsey Paint & Color Co., 229 E. 42nd St., New York 17, N.Y. Called the Metalast system, it is said to be applicable to all metals and to resist all types of corrosion, fouling, and abrasion.

Metalast is applied in three stages, by brush or spraying. A single wash-coat primer goes on first to serve as an anchor for the following coats. A Metalast anti-corrosive goes on next to provide a barrier coating with a tough and tight inner-coat adhesion. The third and top coat varies with the color desired and usage.

The Metalast paints are based on vinyl and other plastic resins. The manufacturer points out that they can withstand the effects of severe acids, chemicals, and salts for long periods of time; that they can be applied to steel, aluminum, galvanized iron, and ferrous and non-ferrous alloys; that they contain abrasive qualities that resist chipping or peeling; that they dry in less than 20 minutes; that they are unaffected by temperatures up to 200 degrees F, and can be applied in temperatures ranging from 5 to 90 degrees F; that they have no odor, taste, or toxicity; that they are non-inflammable; and that they show good clarity and a resistance to age and weathering.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 28.

Lab for Safety Research

A new 4-story laboratory, the largest of its kind, will be built by the Mine Safety Appliances Co. It will be devoted to research and development of safety equipment for all industries. The building is located one block from the company's Pittsburgh plant, and will be dedicated as a memorial to John T. Ryan, one of the founders of the company.

Macadam-Base Construction

Construction of macadam bases using the Pulvi-Mixer machine is covered in a booklet prepared by Seaman Motors, Inc., 305 N. 25th St., Milwaukee 3, Wis. Bulletin No. 60 begins with a brief description of macadam pavement and its development. It then goes into a step-by-step explanation of how to build this type of pavement with the Pulvi-Mixer, and tells why the machine is suited to this kind of work.

The booklet is illustrated by photographs of the machine in use and by cut-away drawings of its internal mechanism. The four-fold action of the mixer—vertical, lateral, longitudinal, and selective—is indicated by sketches and text. Other information in this 16-page bulletin includes a description of auxiliary attachments available for use with the Pulvi-Mixer, and a list of other publications about the machine.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 113.

SOLVE YOUR HAULING PROBLEMS WITH
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Capacities through 75 Ton—Semi and Full Trailers

CARGO CARRIER MODEL GPX (Semi) with Tandem Axles

PATENTED TANDEM AXLE ASSEMBLY—Featuring unusual lengthwise and sidewise wheel accommodation to irregularities in the road. Use of full width tubular, forged, heat treated axles with CAMBER.

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TRANSPORTATION ENGINEERING A SPECIALTY
CEDAR RAPIDS, IOWA, U.S.A.

EATON
2-Speed Truck
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Abutment Work Starts At Hungry Horse Dam

General-Shea-Morrison Begins Construction On 520-Foot-High Dam In Northwest Montana

✦ THE dreams of men who visualized Hungry Horse Dam 25 years ago are coming true. Construction has begun, and with it a new era of economic development for the northwest.

Under a big $43,431,000 contract with the U. S. Bureau of Reclamation, a joint-venture firm of twelve contractors is starting the big job. The contract was let April 21, 1948, and work began officially on June 7. It is hardly a fly-by-night job; 2,000 calendar days are allowed for completion.

The twelve contracting firms are known for this job as General-Shea-Morrison after the three principal sponsoring companies: General Construction Co. of Seattle, The Shea Co. of Los Angeles, and Morrison-Knudsen Co., Inc., of Boise. The whopping-big contract includes construction of the dam and power plant, service and access roads, and appurtenant work. It does not include operating machinery in the dam or power plant; these items will be furnished later by the Bureau of Reclamation.

Exploration work for a feasible site for Hungry Horse Dam has been under way a quarter of a century. First studies were made by the U. S. Geological Survey, followed by exploration work by the Corps of Engineers of the Army, and finally by engineers of the U. S. Bureau of Reclamation. A detailed account of the history and geological aspects of this mighty multiple-purpose barrier has appeared previously in this magazine. (See C. & E. M., April, 1947, pg. 57.)

Dam Design and Purpose

The big concrete dam is situated in the scenic Flathead Valley of northwestern Montana, near Glacier National Park. Its site lies between deep canyon walls of the South Fork of the Flathead River, about 5 miles above its mouth where it empties into the main stream. It is 25 miles northeast of Kalispell, and 12 miles south of the west entrance to Glacier National Park, a summer mecca for thousands of visitors. The project lies wholly within the Flathead National Forest, an area of 2,600,000 acres of virgin timberland. Deer, elk, and bear are seen regularly by the men on the crews.

Construction funds were authorized by an act of Congress dated June 5, 1944. Work began at the end of the war on such pre-construction activities as exploration and the preparation of designs and specifications. The purpose of the dam, as authorized by Congress, is to provide for the irrigation and reclamation of arid lands, generation of hydroelectric power, flood protection of agricultural lands in the Flathead area, regulation of stream flow, and the improvement of navigation on the lower Columbia River.

Hungry Horse Dam is to be a concrete arch structure somewhat like Hoover Dam. It will rise 520 feet above bedrock, with a crest length of 2,100 feet across the canyon. Hungry Horse will be the world's fifth-highest and fourth-largest concrete dam. Approximately 2,900,000 cubic yards of concrete will be placed in the structure in 5-foot lifts.

There will be cooling pipes in each 5-foot lift through which river water will be circulated to remove the heat generated by chemical action as the cement hardens. Thus the heat from the mass will be removed in a matter of weeks instead of years. For this cooling

(Continued on next page)

C. & E. M. Photo
From the right abutment of Hungry Horse Dam, we look down 700 feet to the river. Drillers and powdermen are at work.

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Abutment Work Starts At Hungry Horse Dam

(*Continued from preceding page*)

system, a total of 3,600,000 pounds of metal tubing will be imbedded in the dam. The dam itself will require about 17,000,000 pounds of reinforcing steel and fabric.

The spillway will be a glory hole varying from 24.50 to 34.79 feet in diameter, which will pass a flow of 53,000 cfs. A diversion tunnel 36 feet in diameter and 1,180 feet long has been completed by the Guy F. Atkinson Co. to divert the waters of the South Fork during the construction of the dam. At present, while the abutments are stripped, the river flows unhampered in its regular channel.

The power plant will be a concrete structure 400 feet long and 130 feet high. It is to be located at the downstream toe of the dam in the river channel, and it will house four 75,000-kw generators, each driven by a 105,000-hp turbine. Two 250-ton traveling cranes are to be installed in the power plant.

The reservoir to be created by the dam will form a lake 34 miles long with a capacity of 3,500,000 acre-feet of water. It will be 3½ miles wide at its widest point. The area to be flooded contains no private land, but about 70 per cent of it is covered with good timber. Work is also in progress on clearing of the reservoir. (See C. & E. M., Feb., 1949, pg. 63.) An estimated 27,000 acres of land has to be cleared.

A camp has been built on the project for Government employees and their families. Homes are mostly of the prefabricated type, though several permanent-type residences are being built for key personnel—fourteen 5-room residences at a cost of $12,900 each, and six 6-room residences at a cost of $14,600 each. (See C. & E. M., Dec., 1948, pg. 38.) An administration building, warehouses, laboratories, garages and sewerage, and water and lighting systems complete the camp. General-Shea-Morrison is also building a similar camp to house about 1,000 of its men.

C. & E. M. Photo

A Northwest 80-D shovel mucks blasted rock out of a tail-tower cut at Hungry Horse Dam.

Power Features

Hungry Horse power plant will have a generating capacity of 300,000 kw. The first unit is to be installed in 1951 and full generating capacity is expected to be available by 1954. Power produced at Hungry Horse will be integrated with the Bonneville and Grand Coulee systems, and with other plants of the northwest power pool. The Bonneville Power Administration is to be the marketing agency for the power produced.

The dam will also permit some regulation of the Flathead and Columbia Rivers, thus producing additional kilowatts of power at present and proposed plants downstream. The project will increase by 334,000 kw the power capacities of existing downstream plants at Kerr Dam and Thompson Falls, Mont., and at Grand Coulee, Rock Island, and Bonneville Dams on the Columbia River.

The extent of irrigation development has not yet been determined. Congress has authorized construction of irrigation facilities after a report on their feasibility has been made. Investigations for this report now are under way.

Contractor Faces Huge Job

When General-Shea-Morrison moved in to the job, a modern 50-mile-an-hour highway had already been carved out high up on the right wall of the canyon. (See C. & E. M., Jan., 1948, pg. 65.) This road dead-ended at the right abutment of the dam at its crest elevation.

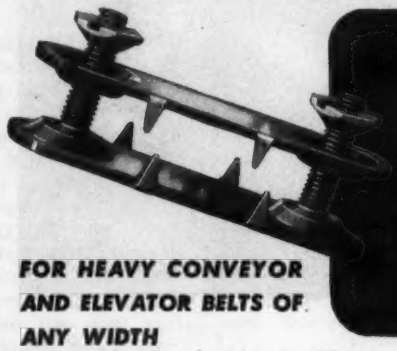
Initial excavation work to get the dam ready for concrete called for the removal of about 950,000 cubic yards of earth and rock, not including that material in various access roads for the dam. A rough bulldozer road had previously been built by the Bureau to get men and exploring equipment in to the site. This road led generally along the stream bank low on the right side. It had to be widened, straightened, and resurfaced, involving about 200,000 cubic yards of excavation.

Moreover, other important items had equally high priority. First of all, a 1,000-man camp had to be built. This work is now well along, and consists of four 150-man bunkhouses, 50 family cottages, and 50 trailer parking facilities. The main administration building is a large Quonset hut, and is complete. An equipment-repair shop has also been built.

Moreover plans had to be made for the big cableway and batch plant, which will be set up this year to pour the concrete. Details on these installations will appear in subsequent issues of CONTRACTORS AND ENGINEERS MONTHLY, but according to men on the job, the cableway and batch plant which poured Shasta Dam in California will be used at Hungry Horse.

The big job for 1948 was excavation. And it was dangerous excavation—a job to separate the good operators from the bad ones in less than a shift.

(*Continued on next page*)



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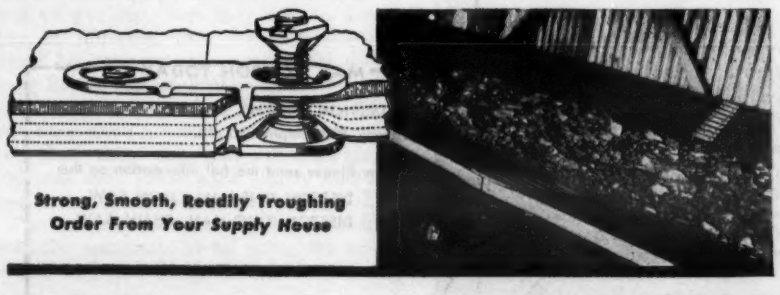

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Excavation Work Begins

The gorge walls at the dam site rise sharply from the river. There is some slope to the left abutment, if a man is imaginative enough to give it the benefit of the doubt, but the right wall is so steep that a rock of any size will roll all the way to the bottom. For this reason, the right abutment has to be worked down slowly the entire distance, beginning at the top with the cut for the cableway track. The left abutment is somewhat easier. Work is well under way on both abutments.

On the left side of the river, which is also the south side, access roads for excavating operations have been built into and across the dam abutment, leading on to disposal dump areas upstream in the reservoir area. The first of these roads is near the river, the second is about halfway up to the top of the dam, and the third is about 500 feet above the river.

The plan of attack is this: a shovel on the lower level works as much of the material out to trucks as it can reach, assisted by explosives and a bulldozer from above. This machine also carries the excavation right to the stream, some little distance farther down.

On the second level, another shovel, with trucks and bulldozer, first reaches as far up as it can. This machine also benches down, working towards the lower machine. The same procedure is followed by the equipment on the upper level. Roads are gouged out to permit these machines to leave the area when their work is finished. When some of the last scaling is done, there will be spectacular blasts which will topple many tons of rock down to the floor below.

The heavy-excavation equipment fleet consists of 5 Northwest 80-D shovels, a Northwest 78 shovel, 20 end-dump Euclids to haul material from these machines, 5 Caterpillar D8's and 2 D7's with angling dozers, and a small Caterpillar D4 and D2 for very ticklish pioneer work. A permanent air-compressor station has been set up, with two 800, two 1,100, and two 1,600-cfm Chicago Pneumatic air compressors. Some 8-inch steel air headers reach out to both abutments, and at strategic spots there are 2-inch lead-off pipes with a valve and a manifold which will permit several drills to hook on.

Drilling equipment consists of 10 Chicago Pneumatic wagon drills, with about 50 Chicago Pneumatic portable jackhammers.

Drilling and Shooting

Before drilling and shooting could be done to any extent, some pioneering was necessary. In many places, men first worked with shovels to bench a small place away on which to start. Where possible, the small bulldozers were used.

An unusual type of new drill steel and bit is being used on this job. Manufactured by the Throwaway Bit Corp. of Portland, Oreg., it has proved unusually successful in drilling the tricky Siyeh limestone formation which is loaded with mud and shale seams. The end of the drill steel, where bit threads normally are found, is slick, machined to a true diameter. The insides of the detachable rock bits are also finished to this same diameter, so that the bits have to be driven on with a few blows of a hammer and starting device.

The bits, however, are of variable temper. The cutting edges are very hard, but the metal which fits the drill steel is soft and will cling without twisting. When driven on, the bits fit smoothly against the drill-steel shank. When they are worn out, they are simply driven off by a special bit puller, and discarded.

In the time these bits have been in use, however, they have shown many distinct advantages, according to the men in charge of drilling and excavation work. The bits come in various colors, each of which denotes a certain size. When they hit mud seams, they have plenty of edge to cut themselves out, and stuck drill steel is now very rare. The bits are finished with very small flat surfaces on the four cutting edges, which make for eight cutting edges instead of four. This has not speeded penetration appreciably, but it has reduced the rock dust to finer powder and made it easier to blow out the holes.

C. & E. M. Photo

General-Shea-Morrison's Excavation Foreman E. E. Steeples (left) and Excavation Superintendent Les Gardner hold a Monday morning conference high up on the right abutment of Hungry Horse Dam in Montana. Excavation was the big job on this project for 1948.

Moreover, the new-type bits have drilled up to 80 feet each before they have had to be discarded. The Siyeh limestone on both abutments is hard, and contains probably 55 per cent of impurities such as silica, but the bits are consistently giving about 45 feet of hole per unit. All discarded bits are tossed into a barrel, and occasionally someone picks through the pile to discard those which are completely worn out. Those which will drill a few more feet are used on the short holes which always seem to crop up.

Drill steel 24 feet long is used on the wagon drills, while 14-foot steel is the limit on the pneumatic hand drills. Drilling is going forward 24 hours a day because there is much of it to be done. Some of the jackhammer work is quite spectacular, with men hanging by safety belts and ropes hundreds of feet above the river to drill the first holes.

Holes are loaded with 40 per cent du Pont gelatin, and set off with No. 6

(*Concluded on next page*)

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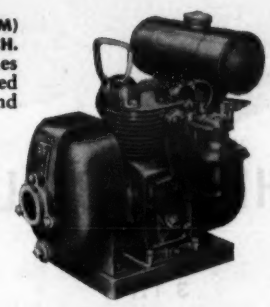

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Abutment Work Starts At Hungry Horse Dam

(*Continued from preceding page*)

Atlas electric blasting caps. The abutment excavation shots were pulled instantaneously from the power line, but delays will be used later when excavation gets under way on the spillway glory hole.

Shovel and Bulldozer Work

As the shots are pulled, the various shovels and their Euclids move in to dispose of the material. Wherever possible the shovels are worked against the full 24-foot face, but of course this ideal condition is exceptional. More often than not, a shovel picks up a rather shallow bank while a bulldozer shoves material in from above.

There have been some terrifying near-accidents, but the operators at Hungry Horse are mostly old-timers with nerves of steel. The operator of a Northwest shovel perched precariously on a slope 250 feet above the river had the nerve-shattering experience of hearing his drive chain snap in two. Free to roll, the machine lurched towards the edge of the tiny platform. Coolly the operator dropped his dipper and tried to stop the machine. It had too much momentum, and he left his cab just in time, it seemed. But the shovel rolled only twice until somehow the boom and dipper stick stopped the roll. Dozers cut a new road in to the spot to get the rig out, and after a few shifts it was working again.

Bulldozers sometimes hang by cables from stumps up above, as a safety measure while they start to bench off. The blasted places are the worst, for sometimes a whole chunk of material breaks off at the edge, where the machine is trying to push loose material over.

The Euclids, of course, have better footing, for they travel on roads already blasted and built. They dump the material in a spot where it will eventually be covered with water, in the reservoir area up ahead of the dam.

Excavation work with the shovels is going forward two 10-hour shifts per day, with lubrication, fuel, and repair service available on the job.

Personnel

General-Shea-Morrison's big outfit is headed by C. W. Wood, with R.W. Jones as Chief Engineer on the job. Les Gardner is Excavation Superintendent; Ted Harris is Plant Superintendent; Tom Moyer is in charge of camp construction; Fred Crocker is doing the cableway design; D. H. Henderson is Office Manager; Mel Hord is Electrical Superintendent; George Gavert is Master Mechanic; Tom Star is in charge of pipe fitting; and Dick Savage is Paymaster.

The big dam is under the general Government supervision of L. N. McClellan, Chief Engineer, with R. J. Newell as Regional Director. Clyde H. Spencer is Construction Engineer for the U. S. Bureau of Reclamation.

New Straddle Truck Hauls 18,000 Pounds

A straddle truck with a capacity of 18,000 pounds is announced by the Hyster Co., 2902 Clackamas St., Portland 8, Oreg. It is powered by a 6-cylinder 82-hp gasoline engine and has four speeds forward and back. It can be geared for a maximum travel speed of from 30 to 45 mph.

One of the main features claimed for the Hyster straddle truck is its spring-suspension system. This is said to provide better riding and easier steering, give more traction for the driving wheels, reduce frame stress and tire wear, and facilitate travel over slippery or rough road surfaces.

Hyster's improved Model M straddle truck has a capacity of 18,000 pounds and is powered by a 6-cylinder 82-hp gasoline engine.

The truck is equipped with four 9:00 x 20 pneumatic tires, and will turn in a distance of 12¼ feet. It has 4-wheel hydraulic brakes and a mechanical swinging-shoe control. Vacuum and automatic shoe control are available as optional equipment. A positive-acting automatic stop is designed to prevent over-run of the worm-gear-driven roller-chain hoisting and lowering mechanism. Other features include a large radiator, hinged radiator hood, hood vents for ventilation and windshield defrosting, heavy differential, and a sturdy driving-head spindle.

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Heavy-Lifting Hazards In Building Industry

Workers Too Impatient to Wait for Help in Lifting Heavy Loads May Suffer Heart Ailments, Hernia, Etc., From Overstrain

By DR. W. SCHWEISHEIMER

✦ A BUILDING worker is confronted with a scaffold to be moved from one wall to another—or a sack of cement to be lifted—or a heavy board to be picked up. He feels there isn't time enough to call for assistance; he's impatient to get the job over with. So he moves the scaffold, or lifts the bag of cement, by himself.

In doing so he may place an excessive strain on his back, his shoulder, his abdominal or his heart muscles. He may pay for his impatience with a hernia, leg trouble, lumbago, injured nerves, or a heart ailment.

Heart

We should remember that the heart is a muscle and may get tired just as arm or leg muscles do if overstrained. A healthy heart, well trained by long practice, will not revolt against extra strain imposed upon it by heavy lifting. But a man can be a very efficient worker in the building industry—a skilled mason or roofer, for example—without being exceptionally robust. And while his heart may do a good job as long as he sticks to the average kind of work, it may suffer under an exaggerated strain.

Even if he is healthy, excessive exercise may give rise to asthma or shortness of breath, palpitation of the heart, giddiness, a sense of fatigue or utter exhaustion, and sometimes a pain in the region of the heart. These signs are the normal reply of the body to continued physical strain. While a relatively weak worker will experience them sooner and after less strain than a healthy worker, even the healthy one may feel distress from over-exertion.

Moreover, repeated overstrain may well produce an enlargement of the heart muscle—sometimes referred to as "athlete's heart" because athletes too may acquire it as an occupational ailment.

There is no better advice to a worker in the building industry than to avoid over-exertion and to call a fellow worker for assistance when lifting heavy loads. And if he feels he *has* overstrained himself, he'd better put in some days of rest—that's the best and quickest way to bring the heart back to normal. We need hardly add, of course, that young people who seem to have weak hearts should be advised not to choose an occupation which may entail physical over-exertion.

Pressure on Nerves

A mason carrying a heavy sack of cement overstretched his right arm—probably in connection with a brisk movement. The next day he felt a dull pain in and below the right shoulder. An important nerve had been under pressure because of the weight of the load. Besides the pain he felt, he could not move his right arm backwards and forwards in the usual way. Despite medical treatment, the condition did not improve for quite some time.

Although the nerve strings that join the muscle fibers with the brain are often wrapped in a good layer of protecting fat or connecting tissue, they are closer to the surface on certain spots of the body, and may be injured by strong pressure from outside. Traction on the arm, a fall on the shoulder, and especially the pressure exerted on the shoulder from above by carrying a heavy burden may affect one or several nerves. The muscles in the arm then feel weak; the arm or hand may even be paralyzed.

The long thoracic nerve leading to the muscles of the shoulder is especially susceptible. When it has been injured by an excessive load such as a heavy sack, it may take some time to recover. Proper treatment and the avoidance of heavy lifting will restore it to normal functioning, however.

Backache

The onset of acute backache—also called "lumbago"—may be dramatic in its suddenness. A worker is lifting a load too heavy for his physical strength. He is apparently in perfect health and vigor. But suddenly his muscle fibers are ruptured, he is struck with agonizing pain in the small of his back, and all he can do is lie down on the floor until the pain subsides a bit and he can move again. Sometimes he's not that lucky. Sometimes he cannot make any movement by himself and has to

(Concluded on next page, Col. 2)

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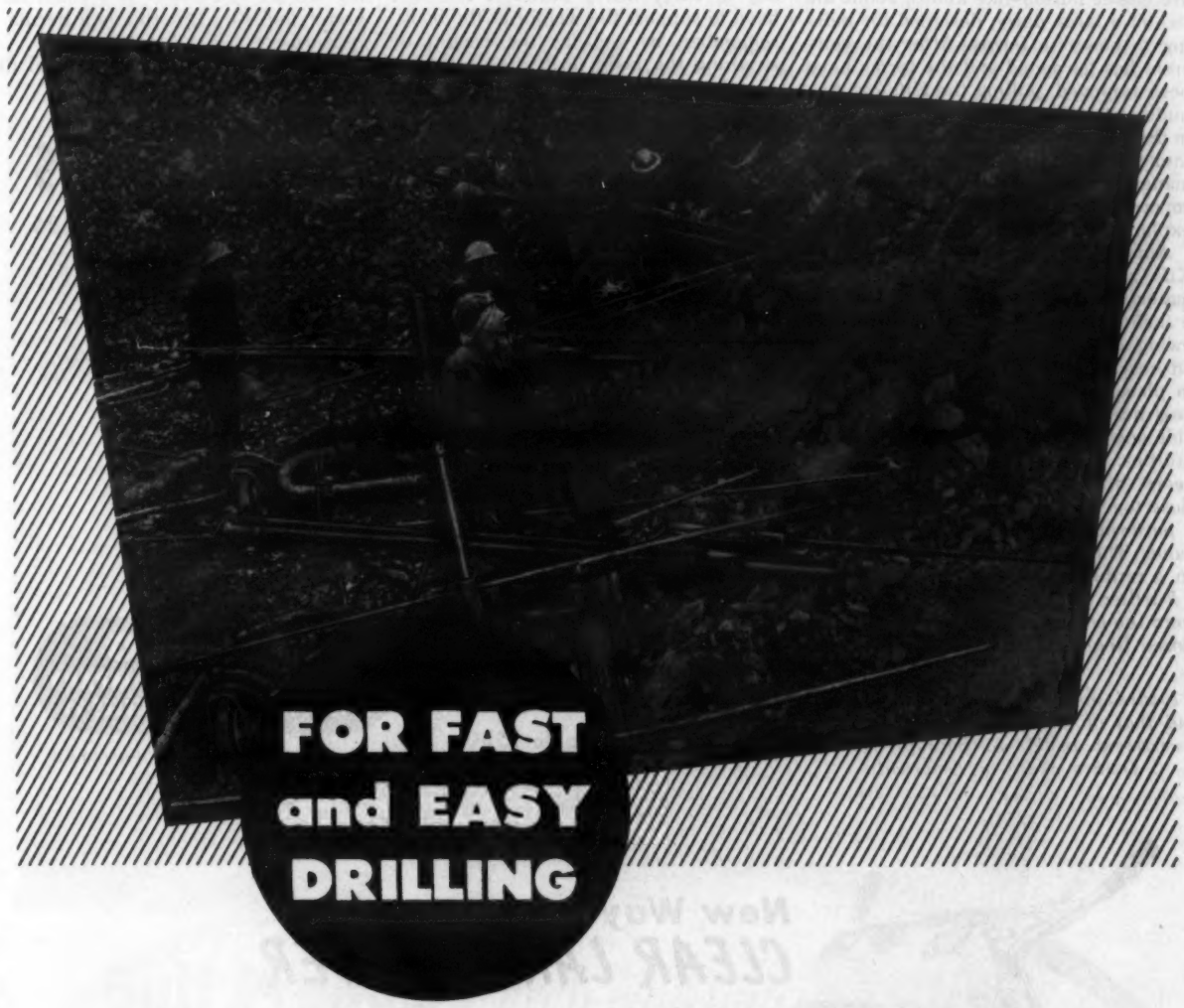

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Because of the flexibility of its mounting, the Wagon Drill can be quickly adjusted for toe-hole drilling or bench drilling. For line drilling, or drilling close to the face, the carriage wheels can be turned at right angles.

Its three roller-bearing wheels, equipped with pneumatic tires, insure ease of movement however rough the ground. The main frame, uprights and mounting are of seamless steel tubing, providing maximum strength per pound of weight.

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The G-200R WAGON DRILL is available with CP-50N (3"), CP-60N (3½"), or CP-70 (4") Drifters.

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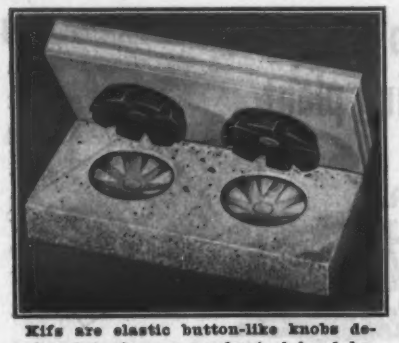

Kifs are elastic button-like knobs designed to form a mechanical bond between concrete and plaster. When the forms to which they are nailed are removed from concrete, undercut cone-shaped cavities are left. These are filled with plaster.

Bond-Forming Device For Concrete, Plaster

Devices for forming a mechanical bond between concrete and plaster have been made available to contractors by Buffalo Products, Inc., subsidiary of Frontier Industries, Inc., 315 Babcock St., Buffalo, N. Y. Known as Kifs, they are elastic button-like knobs, about the size of a large daisy, designed for nailing to concrete forms. After the concrete has hardened and the forms have been removed, pulling the Kifs out too, undercut cone-shaped cavities are left in the concrete. Plaster is then squeezed into the cavities to form a keyed, permanent, mechanical bond between the concrete and plaster, the manufacturer explains.

Among the advantages claimed for Kifs are savings in cost over other materials, the saving of approximately 4 inches of building height per story owing to the elimination of plastering on suspended metal lath, and savings in plaster owing to the smaller thickness needed. Kifs can be used to provide anchors for pipes, ducts, and other utilities; for anchoring of masonry veneers; and other purposes. When set close together, they are said to produce a patterned surface of high acoustical value. They are being made available on a rental basis.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 67.

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Heavy-Lifting Hazards In Building Industry

(Continued from preceding page)

be carried to bed.

Though lumbago is a very acute and disabling condition, it may clear up quickly with proper treatment. However, there is every reason not to repeat the heavy exertion for a long time, since people who have suffered once from lumbago are liable for several months or even longer to a recurrence.

Knock Knees and Flat Feet

Knock knees used to develop mostly when apprentices and young workers had to lift heavy loads. The condition is decidedly less common today with our use of mechanical lifting devices instead of mere hands and arms. But there is no doubt that continuous standing at hard work and lifting heavy loads may bring on the condition, particularly with adolescents.

As for weak or flat feet, they may cause extreme fatigue and pain to a worker who is required to stand all day or carry heavy burdens. The feet have to support the weight of the body, remember, as well as the weight of anything the body is lifting or carrying. If the weight is too great, the arches are pressed down. And after repeated strain, they stay down. A flat foot has developed. The worker suffers from cramps in his calves, burning sensations in the soles of his feet, and pains extending up into his back.

For workers who have trouble with their feet, there is frequently no other choice but to use arch supports of one sort or another, and many people have had excellent results with them. There are factory-made arch supports of different sizes and shapes, but for some workers, individually fitted supports are best.

Hernia

Normally, the abdominal muscles are one firm wall. But sometimes there are small gaps between the fibers of these muscles. A violent exertion, a sudden strain, the lifting or pushing or pulling of a heavy burden, may enlarge the gap, and a loop of intestine may press forward through the muscle wall of the abdomen—in the groin, or just below the groin, on the thigh. The loop cannot be seen since it is covered by skin and fat—all we can detect is a small lump under the skin. But this is a hernia or rupture.

Any worker who has a natural disposition to hernia must be careful not to overstrain himself. And where trusses are not sufficient to keep the hernia back, an operation may be necessary to restore him to full capacity and efficiency.

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PORTABLE HOPPERS
Save truck mixer time
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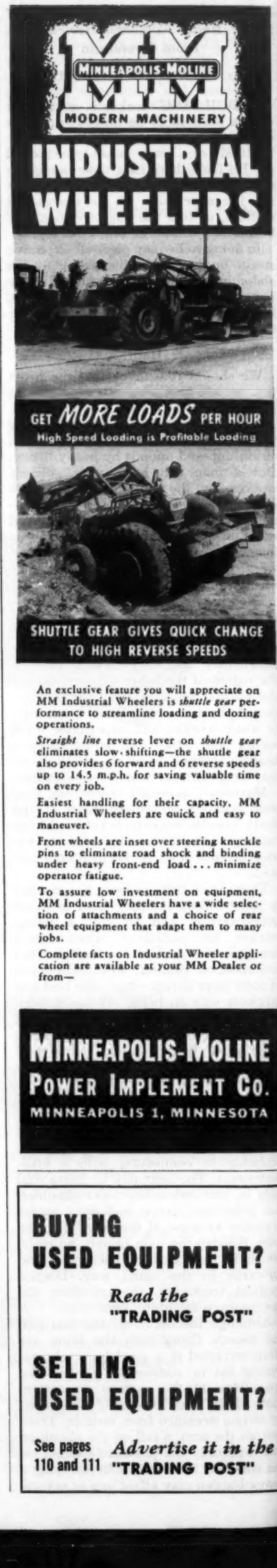
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See pages 110 and 111 *Advertise it in the* "TRADING POST"

Shoulders and Slopes Seeded and Mulched

Subcontract for Roadside Development on a 4-Mile Hot-Mix Paving Job Is Done by a Nursery Firm

✦ LAST July, the Fenton Construction Co. of Troy, Ohio, under contract to the Ohio Department of Highways, completed the surfacing of a 4-mile section of U. S. 68 south of West Liberty in western Ohio's Champaign County. The new 20-foot surface consists of two courses of T-35 hot-mix, with a total average depth of 2½ inches. The original concrete pavement was flanked by shallow curbs on both sides, and had 8-foot shoulders sloping 1 inch to the foot. Seeding and mulching of the shoulders and slopes, totaling 38,000 square yards, was sublet to the French Nurseries of Clyde, Ohio. This roadside-development phase of the contract was completed in August.

In order to drain the surface of the new pavement quickly, sections of the old curb were knocked off, first on one side of the road and then the other in alternate stretches. This permitted a straight grade downwards from one side of the road to the other, from the high side where the curb was still in, to the low side where it had been removed. This procedure was followed even on tangents. The curb was never knocked off on both sides of the road, only on alternate sides for stretches of several hundred feet.

Lime and Fertilizer

The first operation in the seeding process involved the preparation of the ground over both the shoulders and the slopes which extended out to the limits of the dirt work. O. M. Scott & Sons of Marysville, Ohio, supplied the agricultural limestone and fertilizer, as well as the seed, making delivery to the job by trucks. The 80-pound bags of lime and fertilizer were carefully distributed along the edges of the pavement so that they could be readily spread on the ground in the correct proportions—100 pounds of limestone to every 1,000 square feet of area, and 20 pounds of fertilizer to every 1,000 square feet of surface. The fertilizer was a 10-6-4 mix of nitrogen, phosphate, and potash. Both materials were spread out on the ground together by hand.

Right behind the spreaders came a spike-toothed harrow, pulled by a Ford rubber-tired tractor, which broke up the ground to an average depth of about 1 inch. This permitted the essential fertilizing of the surface crust before the spreading of the seed, which was usually done within the next 24 hours. The general procedure was to spread the lime and fertilizer in the afternoon and sow the seed the following morning.

Seeding and Mulching

The seed mix used for shoulders, roadway ditches, median strips, and areas in front of residences consisted of 50 per cent Kentucky bluegrass, 15 perennial ryegrass, 20 alsike clover, and 15 hairy vetch. The mix used in other areas consisted of the same varieties in the following percentages respectively: 35, 15, 25, 25.

The seed was distributed by a Cyclone seed sower at the rate of 4 pounds to every 1,000 square feet. An experienced sower walked over the ground with the mechanical spreader tucked under one arm, turning the crank of the machine with his other hand. By regulating his pace he easily and quickly distributed the seed in the correct amount and in the proper places. One pass over the 8-foot-wide shoulder was usually sufficient to seed that entire strip, as the particles scattered out to the desired limits of the swath.

A pass over the ground was then made again with the harrow to rake in the seed to a depth of 1 inch, after which the ground was at once covered with a layer of straw mulch, 2 inches thick. This straw was obtained from farmers in the vicinity of the project, and came in round bales weighing 40 pounds each, or in rectangular bales of 70 pounds. The bales were dropped from a truck at regular intervals along the road, then opened and spread over

(*Concluded on next page*)

C. & E. M. Photo

Elmer Erlandson of the French Nurseries at Clyde, Ohio, uses a Cyclone seed sower on the roadside-development project on U. S. 68 in western Ohio. One pass is usually enough to scatter the seed over the wide shoulder.

Frank Mashuda Company, Portersville, Pa., has the contract to construct a new 12-mile 3-lane section of U. S. Route 422 between Mt. Chestnut, Pa., and U. S. Route 19. The project involves moving over 1,300,000 yards of earth and rock. Gulf quality lubricants and fuels are helping to keep the job well ahead of schedule.

Gulf Products *keep equipment rolling*

help prevent delays **on big highway job!**

Frank Mashuda Company is one of many leading contractors who have found that the use of Gulf quality petroleum products insures smooth, dependable equipment performance and low maintenance costs.

Gulf gasoline and Diesel fuel are clean burning, have exceptionally low carbon content, and provide more efficient power. Gulf quality lubricants provide an extra margin of protection—prevent excessive wear that leads to mechanical delays.

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C. & E. M. Photo
Rectangular bales of straw mulch are broken up and distributed over seed and fertilizer during shoulder and slope seeding on U. S. 68 south of West Liberty, Ohio.

Shoulders and Slopes Seeded and Mulched

(Continued from preceding page)

the seeded ground by hand.

Holding the Mulch

As quickly as the mulch was spread, it was tied down with binder twine so as to prevent both the mulch and seed from being blown away. This was especially important for the strip immediately adjacent to the edge of the road, where the breeze generated by passing traffic was the strongest. In the well compacted gravelly-sand shoulders, areas of bituminous material existed and wooden stakes for stringing the binder twine could not be driven there. Accordingly, 6-inch steel spikes driven flush with the ground were used to support the binder twine.

The first row of spikes was driven parallel to the pavement and 4 inches off the edge on 4-foot centers. A second row was driven 8 inches off the edge of the pavement, also on 4-foot centers, but alternate with the spikes in the first row. A third row was driven 18 inches off the edge of the pavement, also on 4-foot centers. A fourth row was located at the bottom of the slope or in the ditch; wooden stakes could generally be used for this row since the ground was softer off the shoulders. Binder twine was strung along each of these rows parallel to the pavement.

Another row of spikes, without parallel twine, was driven on 10 to 12-foot centers between the third and fourth rows. Then twine was passed from the spikes in the first row to those in the second, to those in the third, to the spikes on 10 to 12-foot centers, and finally to the fourth row—crisscrossing between these rows to form a diamond pattern which gave the greatest protection to the mulch beneath it.

The straw mulch was not removed, but was left on until it either was blown or rotted away. In the meantime it served its purpose well, for given a little helping rain the seed was usually producing blades of grass within two weeks of being sown.

Quantities and Personnel

The following three items were the principal quantities involved in the seeding subcontract:

Seeding and protecting with mulch	38,000 sq. yds.
Fertilizer, commercial 10-6-4	3.45 tons
Agricultural ground limestone	21.50 tons

A force of 12 men was employed by the French Nurseries on the project, under the direction of Elmer Stimmel, Superintendent.

For the Ohio Department of Highways, Clyde Gentis was Inspector. Dallas Dupre, Jr., is Landscape Engineer, assisted by W. J. Garmhausen.

Details on Dowel Units

Details on the construction and use of Bethlehem dowel units have been compiled in a 4-page folder issued by the Bethlehem Steel Co., Bethlehem, Pa. The dowels are designed to minimize load-transfer problems caused by heavy wheel loads, and the folder explains that they are easily handled by two men.

Folder No. 549 shows how the two identical sections, with dowels welded to their side frames and center wires, are assembled, and how they can be used, as delivered, for contraction joints. A series of illustrations shows how the dowels can be pulled apart and prepared with a filler material for use as an expansion joint.

The folder also contains plan and section views of these dowels, with instructions for installing them. It shows four typical sections: at an expansion joint, at a contraction joint using a removable plate, at a contraction joint using a permanent plate, and at a plane of weakness. There are four detailed drawings of the dowel units in use on a 12-foot lane.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 14.

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ALL YEAR 'ROUND WITH
"WEATHERCAP"
EXHAUST PIPE COVERS

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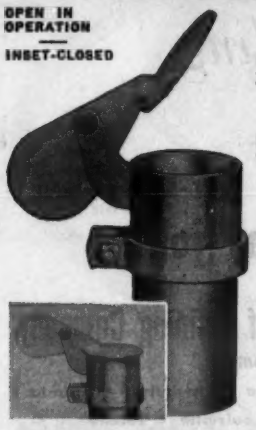

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The "Weathercap" exhaust pipe cover is counterbalanced to open instantly from the engine exhaust pressure—closes automatically when engine shuts down.

Simple protection against dirt, rain and insects during storage or idle periods. No restriction or back pressure, assuring full horsepower output.

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IN TOUGH SERVICE

Typical of GMCs used in construction work is this tandem axle gasoline tractor which moves heavy rock-crushing equipment for an Iowa contractor. GMC heavy duties are offered in gasoline models of four different engine sizes and Diesels of four- and six-cylinder design, in weight ratings from 19,000 to 90,000 pounds.

GMC heavy duty gasoline and Diesel trucks are preferred by operators who haul heavy loads in tough, rugged going. Why? Because GMC heavy duties have engines, axles, clutches, transmissions, springs, frames and brakes specifically designed to move big loads . . . and to move them more dependably, for more miles, at low per-mile cost.

GMC heavy duty trucks are the product of the world's largest exclusive producer of commercial vehicles. They are sold and serviced by a nation-wide organization of truck transport experts. If you're in need of new heavy hauling equipment, let your nearest GMC specialist aid you in selection of a GMC exactly suited to your job.

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GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION

Goodyear's Hard Rock Rib tire is designed for front-wheel service in heavy construction and excavation work.

New Heavy-Duty Tire For Front-Wheel Use

A new type of heavy-duty tire is announced by The Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, Ohio. Known as the Hard Rock Rib, it is especially recommended by Goodyear for front-wheel service in heavy construction and excavation work. According to the manufacturer, the tire helps eliminate the hard steering and vibration encountered in these types of operation.

The tread design of the new tire consists of three heavy circumferential ribs with a shoulder pattern like that of the company's standard Hard Rock Lug tire. The carcass of the Hard Rock Rib is the same as that of the Hard Rock Lug. The tire is currently manufactured in three sizes: 12:00 x 24, 13:00 x 24, and 14:00 x 24.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 56.

Self-Contained Drill Works at Rapid Rate

An entirely self-contained rock drill is manufactured by Warsop Power Tools, Inc., 347 N. 12th St., Philadelphia 7, Pa. It is driven by a gasoline engine and is designed to strike 2,200 blows per minute. According to the manufacturer, it can be used in any position from vertical to nearly horizontal.

The customary cylinder head of a 2-stroke engine is replaced by a special cylinder and piston which acts as the hammer unit. The explosion of the fuel thus drives the hammer piston directly to the shank of the tool. The hammer piston is returned to the striking position by means of by-passed gases, without the need for springs or other mechanical devices. These by-passed gases are also used to rotate the drill and to blow dust accumulations from the hole.

A similar machine to the drill, the Warsop portable paving breaker, is used for concrete breaking, tamping, driving sheathing, digging clay, cutting asphalt, etc., employing standard 1⅛-inch hexagon steels. Each complete unit has an approximate weight of 90 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 108.

Asphalt-Paving Plant

Data on the Madsen 1,000-pound portable batch-mix asphalt plant have been compiled in catalog form by Madsen Iron Works, Inc., 5631 Bickett St., Huntington Park, Calif. This plant is adaptable to all paving mixes, the manufacturer says, and among the features contributing to this adaptability are the aggregate elevator, vibrating screen, aggregate-storage bin, stone-dust elevator, weigh box, asphalt pressure injection, pugmill mixer, unit power transmission, and one-man control. Each of these features is covered in detail in Bulletin No. 200-88.

Other features described in the bulletin are the wheeled chassis, jack-type erections, pressure injection for fast mixing, and the single power input. Among the accessories available for the Madsen plant are a counter-flow drier, a pressure-heater fuel-oil set, portable feed-bunker, steam generator and tank unit, asphalt-storage tank, dust collector, gob boxes, batchers, and level and heat indicators. The final page of the catalog contains a list of complete specifications for the 1,000-pound plant.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 68.

Improved Power Cart

Improvements in the Moto-Bug powered wheelbarrow are announced by the Kwik-Mix Co., a subsidiary of the Koehring Co., Port Washington, Wis. The unit can now be equipped with an optional 4-foot stake platform which is interchangeable with the 10-cubic-foot hopper body; an optional riding step for the operator has been made available; and a dual rear wheel has been placed on the direct-steering mechanism.

The platform body may be tilted for unloading certain kinds of heavy material. Capacity of the unit with the platform is 1,200 pounds. The dual rear wheel is designed to achieve a differential action for ease in guiding and spotting the Moto-Bug. The machine is powered by a standard-make 4-hp gasoline engine, and will travel at speeds from 1½ to 4 mph in forward or reverse. It is 33 inches wide, and will turn in its own length, the manufacturer states.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 8.

2-HP Gasoline Engine

A 2-hp gasoline engine weighing 23 pounds has been developed by the Power Products Corp., Grafton 5, Wis. It is air-cooled and has twin opposed cylinders. According to the manufacturer, it can be used in either a vertical or horizontal position.

The special design of the carburetor and magneto permits the engine to start easily and operate smoothly, the manufacturer says, and prevents it from stalling at tilts as high as 45 degrees. The twin-opposed-cylinder design is said to reduce vibration to a minimum.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 87.

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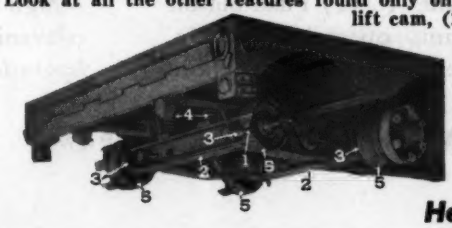

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Poor Soil Creates Tough Engineering

Soil Rebirth Held Key To Better River Control As Two Men Discuss an Article on Agriculture

Current River Chapter
Ozark Protective Association
Bennett, Missouri
January 10, 1949

To the Editors—
CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Avenue
New York, N.Y.

Dear Sirs:

The editorial "Agriculture—Key to Flood Control" [see C. & E. M., Dec., 1948, pg. 4] was called to my attention today. That civil engineers and construction engineers are beginning to realize that proper soil management is absolutely essential to flood control is heartening. Too many of our valuable resources are being flooded out by concrete structures which the public can admire, rather than by solving the problem with a sensible and practical approach to our soil and water resources.

I know whereof I speak, for I am a farmer who has had considerable experience through the years in soil and water control.

Here on Current River, in the heart of the scenic Ozarks, many of our beautiful springs would be destroyed if it were not for the protest this association has presented to the Corps of Engineers and Congress. But the fight is not won. It is just a postponement until the final showdown. When beautiful, clear springs flowing up to 840,000,000 gallons a day make no difference to the dam builders, who would bury them under a lake, it is time to call a halt to such destruction at all cost.

I hope that you and your publication can use your influence to that end.

With millions of dollars spent on each of our major rivers to control floods from the river level, *instead of where the raindrops fall* or shortly thereafter, a system of man-made lakes is being created which would help an enemy nation destroy us. Why blast out a city and its industry? By blowing up a few major dams on a river watershed, an enemy could wipe out not one city, but many cities, our highways, our railroads, and the food-producing potentialities of this river basin. Should atomic or bacteriological warheads be used, our river basins might be desolate for generations to come.

It seems to me that the present method of flood and water control is obsolete even before it is begun, and it is vital that the engineering profession get a new slant on our water-control problems. When they merely build dams, they are living in the past and using methods that would harm our nation. Also, why not begin with a study of our highway systems with the idea of better soil and water control, so that potential floodwaters might be controlled from that angle?

Yours sincerely,

Guy R. Dixon, President

The Reply—

5000 Palm Drive
La Canada, California
January 22, 1949

Dear Mr. Dixon:

It was a pleasure to have your letter of January 10, with your comments on our December editorial "Agriculture—Key to Flood Control". I wrote the editorial, and your letter was referred to me.

You expressed a thought in few words so ably that I have italicized it. *"Where the raindrops fall"* should be the guide as much as possible for future flood works. But flood control where the raindrops fall will succeed only if engineers and farmers know and understand what soil is, what it will do, and how it can be made to soak up raindrops.

To answer the points of your letter in order, let me say that flood-control engineers, as a class, seem to have recognized soils and their importance at least as much as the farmer has. They give it lip service, at least. A few of the more progressive engineers are trying to do something about it, just as some of the more progressive farmers are trying to show by example what can be done.

It is a big job. The situation is ironic. Dams, most of them desirable, are going up, but very little is being done in the watersheds to protect these structures, or to nullify their need.

The engineer cannot be blamed too much. He is only doing his best with a situation which must be solved *now*. He is working with the only tools at his command: earth and concrete.

Progressive farmers, too, are making some headway to protect their topsoil. Through 4-H clubs and allied activities, better farming practices are coming into being. But they are dreadfully slow. We still have many men "who have wore out four farms already, son".

The land gets poorer year after year. People on these lands are undernourished and listless. Communities suffer. As the soil washes away, drought and flood cycles increase in our stream basins.

"I don't understand it," says the farmer. "Lucky we saved our seed corn, so we can re-plant next year."

"I don't understand it," says the engineer, fingering his slide rule. "Our stream-gaging calculations must be off."

When both groups understand it, Mr. Dixon, what a change you will see in your lifetime! You will see a new awareness of the heritage we hold in the soil. You will see universal cover-crop protection. You will see country-wide

(*Continued on next page*)

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Other important Adams features include generous clearances for blade maneuverability—high-arch front axle for better clearances—convenient control levers—standing or seated operation. See your local dealer for full details.

J. D. ADAMS MANUFACTURING COMPANY • INDIANAPOLIS, INDIANA

strip farming, modern organic and organic-chemical agriculture, and a rebirth of soil in general.

River valleys would take on a new look. They would be verdant in flood season, covered with lush growth to stop the raindrops where they fall. The streams—with the deep pools we knew in our boyhood—would clear up again, and fish would reappear. That guilty, spiritless "the government is paying me for letting it lie idle" look would disappear from the faces of the farmers you know. In its place would come a look of accomplishment and peace, because farm productivity begins with the soil and it pays off in the satisfaction of feeding a starving world. I dare say that as the land prospered, you would see the houses repainted, people less neurotic, and bigger church congregations.

I am not departing from engineering as much as you may think. These results would mean much to the flood-control engineer. If this new concept of agriculture were adopted widely, it would make his job much easier.

It seems incredible that farmers do not realize the power they hold in collective soil management. They are organized as no other group. They have one of the most powerful lobbies in Congress. Yet they have never gotten together on this simple business of making a raindrop soak in the ground, or running off clear if desirable.

Underground Water

Your organization has protested to preserve the beautiful springs near Bennett. This is commendable, if only because it represents democracy at work. But are you sure that even if your fight with the Corps of Engineers and Congress is successful, bad soil practices somewhere else may not act to dry the springs anyway?

Springs all over this nation are drying up, their water supply shut off because poor soil prevented it from soaking in the ground somewhere up in higher country. The water that ought to be feeding these springs is instead down in some dam reservoir — or some damned reservoir, if you prefer—carrying with it millions of tons of topsoil.

Louis Bromfield has proved at Malabar Farm, in Ohio, that good soil practices will restore many dried-up springs to productivity. It is another example of the general benefit which proper soil management will bring.

A vast system of underground water in the subsoil is the natural way to take care of rainfall. It is vital to our food supply. No amount of engineering and concrete can take its place.

Of course, a considerable number of dams will always be necessary. Dams will be desirable to impound irrigation water, and to develop hydroelectric energy, until such time as atomic power comes into its own. Because these dams will continue to be needed and built, contractors and engineers will continue to be needed. In a growing civilization, there will always be opportunity for these men to contribute their skill.

The Atomic Aspect

You mention the possibility of large-scale destruction if atomic warheads blow up our dams, and bacteriological materials contaminate their waters. The awful force of the atomic bomb is vividly described in "No Place To Hide", currently condensed in "Reader's Digest". If you will read this, you will see that an enemy will not have to use our reservoirs. The Bomb, dropped in a river, would render it radioactive below the point of drop for a long time, even if no dams were present. But if war should come again, involving the use of atomic and bacteriological weapons, our discussion here would be beside the point. There are too many vulnerable cities, where populations are concentrated, to waste time with reservoirs.

If another war comes, Mr. Dixon, more than river basins will be at stake. Civilization itself hangs in the balance. Our discussion of flood control is irrelevant to the implication of atomic war. To me, atomic destruction mentioned in connection with flood control is merely a persuasive device.

Are Dams Obsolete?

You say that flood-control-dam builders are living in the past, and using obsolete methods. You may be right. But here again, as in any viewpoint, there are two sides to consider. Ask yourself, "Why are they building dams?"

They are building dams because farmers will not let them tamper with their soils. Flood and drought cycles have grown to the point where public pressure is demanding that they do *something*, and a dam as such is at least a visible evidence of such works. If we grant that it is an obsolete method, that soil rebuilding and conservation practices are the answer, should not the initiative in that regard come from the farmer, instead of the engineer? Thinking so, one cannot condemn the engineer for dealing with the problem in the only temporary way he has at his command.

You ask why not begin a study of our highway systems with the idea of better soil and water control. It is a good question, and fortunately most states now have roadside-development programs. They recognize the importance of covering up the ugly grading scars with cover of some kind.

Your own state of Missouri, for example, is doing a great deal of seeding with low-growing grasses. Iowa is going a step farther: flattening off the slopes so a mower can work comfortably. Then they plant legumes and some hay crops, and give farmers permission to cut the hay. The State saves mowing costs, and the farmer gets added hay acreage. What a shame the farmer and the flood-control engineer do not learn to work together this way for their mutual benefit!

Problem Is Tremendous

In this limited correspondence, neither of us has scratched the surface.

(Concluded on next page)

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1 Push-Button Starting From the Cab Starts Big Diesel Engines Quickly, Easily—in All Weather.

2 Positive Mechanical Controls are Conveniently Located for Fast, Accurate Blade Adjustments.

3 Highly Efficient Steering Gear Plus Improved Front Axle Design —Power Steering on Large Models.

4 Good Visibility of Blade and Work Being Done —Shown here is a Worm's-Eye View from the Ground to the Operator.

ONLY ADAMS OFFERS ALL THESE OUTSTANDING ADVANTAGES

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- Positive Mechanical Controls
- Wide Range of Blade Adjustments
- Exceptional Blade Clearance in All Operating Positions
- Balanced Weight Distribution
- Easy Access for Fast Servicing
- World-Wide Dealer Service

Make your next motor grader an ADAMS

Poor Soil Creates Tough Engineering

(*Continued from preceding page*)

The only thing that will make an impression is the collective effort of farmers, stockmen, timbermen, and sportsmen in this nation—each acting towards the one common objective, in his own small way, to take care of the raindrops where they fall.

That little rule will hold true wherever you apply it. Instance after instance can be cited, on any plane you want, to bolster the point.

Organic compost added to soil formerly dry will hold its moisture for many days, because those billions of tiny organic sponges are all at work to catch and hold the water. One does not have to be an organic faddist to recognize it. That is why you seldom if ever read of serious floods in a region, say, like Sweet Grass County, Montana. The land is too well covered with grass which still grows up to a Hereford's belly. The rule always works.

Carry it even further. The most colossal example I know of is Hoover Dam. Only here the rule has worked in reverse to the extent that engineers are frantic.

When Hoover Dam was built, over 700 feet high above the bedrock of Black Canyon, engineers said the mighty Colorado was whipped forever. But what has happened? Last month, 13 years after the dam was dedicated, the U. S. Bureau of Reclamation released some startling statistics. In that period of time, the mighty Colorado, loaded with topsoil from the overgrazed rangeland of Colorado, Utah, Nevada, New Mexico, and Arizona, and with its own silt it makes in eroding its riverbed, dumped 400,000 tons of silt in the reservoir *every day*. The mouth of the Colorado at its juncture with Lake Mead had moved downstream 40 miles. There is an average of 60 feet of mud in the reservoir, 260 feet in some places, and 100 feet in front of the dam.

One of the streams above Hoover Dam is the Virgin River of southwestern Utah. I hunt deer each year near Enterprise and Gunlock, along that stream basin and the adjoining mountains. For several years the over-grazed land would raise hardly anything but goats. Goats and sheep make many miles of trails with their hoofs, and the ground is soon bare. When cloudbursts occur, as they sometimes do, the brush-covered rangeland fares fairly well, but the trails wash out sometimes 2 and 3 feet deep. They sometimes get wide enough so you can hardly jump your horse across.

One of the local game wardens has tried desperately to call it to the attention of the stockmen. All his efforts are strictly on a friendly, local scale. But stockmen say, "What's the matter with you, Vern? That erosion isn't going to hurt. It will take five years to build up the range, and how do we know prices will be good that long from now?"

Multiply that example by hundreds of thousands, Mr. Dixon, and you will have an idea of the enormity of the problem.

Until such time as you can convince all your farmers that they hold a heritage in trust, I am afraid that our flood-control engineers cannot stop building large dams. If only this simple rule of raindrops on the farm were applied, the individual farmer could multiply crop productivity at great profit to himself. That is what makes the situation so ridiculous.

I hope, as you do, that soil rebirth will soon become more general. We haven't much time. It has been estimated that every person in the world needs between 2.5 and 3 acres for his sustenance. We are down to *nine-tenths of one acre* today. World population is doubling and re-doubling dangerously. One-fourth of our land is in critical danger of erosion. Soil productivity is declining dangerously. And I have not tried to use "dangerously" in a loose sense.

If you can wake up your farmers, you have made a much more solid beginning than by fighting Congress and the Corps of Engineers. If you believe that the Army has no moral right to despoil the beautiful springs down there in the Ozarks, realize too—and preach it—that your farmers have no moral right to despoil even one square foot of their land, even if they do hold the deeds.

This magazine, as well as our thousands of engineer readers, wish you every success. We know that poor land means poor plant life. We believe that poor plant life means bare ground, terrible erosion, and floods. Only sound soil practices can save us both, engineer and farmer alike.

More and more the Soil Conservation Service is realizing the necessity for small detention dams and catch basins. Work is now under way on a small scale in 11 watersheds, surveys are being made on 50 others, and the President's budget for this year includes $7,000,000 for Soil Conservation Service flood-control work.

We need 6,000,000 miles of terrace construction, over 1,000,000 farm ponds, land leveling and improvement of irrigation on 11,000,000 acres, drainage improvement on 30,000,000 acres, tree planting on 12,000,000 acres, gully control and channel stabilization.

It is too big a job for engineers alone to do. They need your help, and the help of every other farmer.

Very sincerely,
Raymond P. Day
Western Editor

Florida Road Conference

The third annual Florida Highway Conference will be held in Gainesville on May 9, 10, and 11. This conference is designed to promote cooperation among all groups concerned with highway and street problems in the state. It is sponsored by the University of Florida.

Discussions will stress long-range planning, highway and street maintenance, and recent technical advances. A road show will also be held.

Improved
FOR INCREASED PRODUCTION

A few of the new features that cut down-time and increase hourly earnings

- NEW Heavy Duty Constant Mesh Transmission
- NEW 32-amp. Generator
- NEW 12 cu. ft. Piston Type Compressor
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PLUS all these original high production features

- Big Capacity—17½ yards heaped
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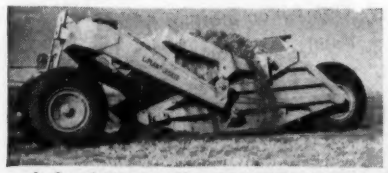
6, 8 and 14-yd. cable scrapers for any make of track type tractor.

2 and 4-yd. hydraulic scrapers for track type tractors.

2 and 4-yd. hydraulic scrapers for [illegible] rubber-tired tractors.

LAPLANT CHOATE HIG

Two Lubrication Guides For Construction Machines

Lubrication of earth-moving and construction equipment and lubrication of air compressors is dealt with in two booklets issued by the Cities Service Oil Co., 70 Pine St., New York 5, N.Y. Both booklets contain a complete discussion of lubrication requirements for the best maintenance of equipment.

The booklet on earth-moving and construction equipment is divided into four sections. The first discusses the structure of matter and nature of friction, and the general theory of why lubrication is necessary. The second section discusses the various machine elements which require lubrication. The third section illustrates and describes the actual lubrication of heavy-duty equipment, including the engine, moving parts, wear surfaces, etc. The fourth section discusses the lubrication of compressors, pneumatic tools, pumps, and rock crushers. The booklet also contains a lubrication chart covering the various machine parts, how each is lubricated, recommended lubricants for each, and the grade of lubricant to be used for various temperature and operating conditions.

The compressor-lubrication booklet opens with a brief discussion of the mechanics involved in the compression of air. Next, it illustrates and explains the construction of various types of air compressors and how they operate. It describes the functions of the component parts of these various compressors, and tells how to lubricate them so that they will continue to perform satisfactorily. It discusses the various types of compressor oils, makes recommendations about when and where to use each one, and lists useful operating hints.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. For the catalog on construction equipment, circle No. 92; for the compressors, No. 93.

Marlow Appoints Rubin, Jr.

Andre S. Rubin, Jr., is the new Sales Manager for Marlow Pumps, Ridgewood, N. J. Mr. Rubin will direct sales and sales promotion for the entire line of Marlow pumps. He has been with the company since 1942.

and lower operating and maintenance costs

Now you can have an even better LPC Motor Scraper, improved at every point so you can be sure it will stay on the job continually — complete your job on schedule — and assure good profits!

Increase production and profits — with the new transmission, you can use *all* of the 225 H.P. to handle capacity loads, at top speeds, up and down grades, even in tough operating conditions. Figure the added profit at your own bid prices of one additional load per hour over 10,000 hours of operation. The new 32-amp. generator provides all the "juice" needed for 'round the clock operation. Bigger air compressor for greater air output and more intermittent compressor operation. Improved cable control unit and controls save valuable seconds — give accurate spreading control.

24:00 x 29 24-ply traction type tires—interchangeable front and rear. 21:00 x 29 also available.

Add these and other new and improved features to the original proven high production features and you'll see why LaPlant-Choate Motor Scrapers give you the lowest possible cost per yard — per hour — per day for the long life of the unit.

Ask your nearest LPC distributor to show you a Motor Scraper in operation and for the complete details of all the improvements which mean more profitable earthmoving for you. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa — 1022 77th Ave., Oakland, Calif.

HIGH SPEED EARTHMOVING EQUIPMENT

Fog-Dispersal System Installed at Airport

A Fido fog-dispersal system has been installed at the Los Angeles Airport. The Fido is a British wartime development and is named from its file classification—"Fog, Intensive Dispersal Of".

By the use of controlled burners, the system generates heat which raises the temperature of the air 3 degrees and also its dew point—the point at which the air has all the water vapor it can hold at that temperature. The warmer the air, the greater this ability to hold moisture. Raising the dew point causes the fog lying on the runway to be dispelled, and the ceiling is lifted to a point where a plane can land safely.

The installation has 392 triads, each of which is equipped with three Todd Shipyard jet-atomizer nozzles. These nozzles are designed to send up a flame 9 feet high and 10 feet in diameter at the top. Diesel fuel is supplied to the nozzles under a pressure of not more than 1,000 psi. The triads are spaced from 10 to 75 feet apart, and, in general, parallel the runways. They are set to take advantage of the wind drift normally associated with the fog.

Installation of the system involved laying 34,000 feet of pipe line of various sizes and setting up a control house, fuel-storage tanks, pump and strainer house, complete electrical system, and atomizers. Total cost of the installation is approximately $842,000. The five major airlines operating at the airport—American Airlines, Pan American World Airways, Trans World Airlines, United Airlines, and Western Airlines—are underwriting the operating cost, maintenance, and the $386,541 of capital expenditure advanced by the City. The Civil Aeronautics Administration, through the Federal-Aid Airport Program, is advancing the remaining $455,459.

Fido was originally developed by the British and further developed by the U. S. Navy in Alaska. It reached its present refinement at the Landing Aids Experiment Station, Arcata, Calif., jointly supported by the CAA, the Air Force, and the Navy.

Lightweight Engine

A lightweight gasoline engine is announced by the Lauson Co. of New Holstein, Wis. This ¾-hp 4-cycle one-cylinder engine has a total weight of 23 pounds. Among the features claimed for it are ball bearings on the crankshaft, float feed, automotive-type carburetor, flyball governor, and high-tension magneto.

The Lauson engine has a 1⅝-inch bore and 1½-inch stroke. Piston displacement is 3.11 cubic inches. The direction of rotation, viewed from the power take-off side, is counterclockwise. The Model LMC has a dry-element type of air cleaner, a splash system of lubrication, and a rope starter.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 61.

Variable-Weight Rollers

Variable-weight 3-wheel rollers are the subject of a bulletin issued by the Tampo Mfg. Co., 1146 W. Laurel St., San Antonio, Texas. Folder F-450 features the heavy-duty 5-speed transmission-differential unit. It also includes two large photographs showing how the Tampo roller is designed to permit easy accessibility to the working parts and how the operating controls are arranged for convenience.

The Tampo roller is made in three sizes—6 to 8, 8 to 10, and 10 to 12 tons—and complete specifications are listed for all three models.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 97.

This cut-away view of the Auto-Bloc chain hoist shows its simplified 2-gear hoisting mechanism.

Simplified Mechanism Is a Feature of Hoist

Lightweight heavy-duty chain hoists are announced by David Round & Son, 545 Henry St., Cleveland, Ohio. The Auto-Bloc hoists are available in a capacity range of from ½ to 40 tons. They feature a simplified hoisting mechanism which consists of only two gears and makes possible a saving in weight. The gears are cut from a special alloy steel.

The hoist mechanism consists of a cam-actuated floating inner gear and an outer gear to which the load sheave is connected. Pulling the hand chain causes the camshaft to revolve, actuating the floating inner gear. This inner gear moves eccentrically over the inner circumference of the outer gear; but since it is held in one position, relatively, by eight steel balls, it cannot rotate. It thus compels movement of the outer gear and the load sheave. The cover of the Auto-Bloc is drop-forged from chrome-manganese steel, and is said to have a tensile strength of 200,000 psi.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 53.

Magnetic Rotary Tool Picks Up Loose Steel

A tool for picking up loose steel is available from the Multifinish Mfg. Co., Dept. 342-A, 2114 Monroe, Detroit, Mich. The rotary Multilift Magnetool is used in carpet-sweeper fashion for picking up steel scrap or parts from floors, parking lots, driveways, and similar locations. It can also be attached to a truck for high-speed operations, the company points out.

The magnetic tube rotates with the wheels and picks up metal on its entire surface. The roller is a permanent magnet, and no connections of any kind are needed for using the Magnetool. It is unloaded by pushing a wiper ring from one end of the tube to the opposite end, where a non-magnetic area causes release of the load. The unloading area is tapered so that parts will slide off readily without lodging. Standard sizes of the tool run from 9 to 24 inches in overall width; larger sizes are available on special order.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 42.

Rollers in Two Styles

Pneumatic-tire and sheepsfoot rollers are described in two catalogs available from the W. E. Grace Mfg. Co., 6000 S. Lamar St., Dallas 1, Texas.

Folder PR describes the Grace self-propelled pneumatic roller which has eleven rolling tires. Two types of body are furnished, one for sand or gravel ballast, and one for water. A bottom-dumping door on the sand-ballasted roller saves unloading by hand shovel. The turning radius is short, and due to the weight on driving wheels it is claimed the unit has excellent traction in slippery going. Folder PR also gives data on horsepower, tires, speeds, and tire sizes.

Folder SF-18 contains information on the Grace single and double-drum sheepsfoot rollers, which are made in six models having from 95 to 136 feet per drum. It discusses the shape of the tamping feet, the hollow tapered roller-bearing axle, the method of making axle adjustments, the cleaner bars, and the replaceable foot ends. Specifications listed cover the model number, feet per drum and per row, area of the feet, weights when empty and partially or completely filled with water, diameter of drums, and lengths and widths.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 44 for Folder PR on the pneumatic-tire rollers, and No. 45 for Folder SF-18 on the sheepsfoot rollers.

Data on Wire-Rope Slings

Design details of Hercules Flat-Laced wire-rope slings are listed in a 12-page catalog available from the A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis 12, Mo. The catalog features the advantages and applications of this type of sling.

A large drawing on the inside front cover illustrates the construction of the Hercules slings. It pictures two sections of the sling body showing the wide bearing area and the absence of shearing or scissor action between the rope parts; a section showing the three rope parts which lead from the throat of the loop through each sleeve; and a section showing the seven rope parts that comprise the bearing portion of the loop.

Tables included in the catalog contain information on dimensions, weight, and safe loads for the Hercules Flat-Laced Red Strand slings; standard fittings for use with these slings; and dimensions and weights of hooks, shackles, open sockets, loop thimbles, choker hooks, body thimbles, equalizer thimbles, and draw-bar saddles.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 85.

For NARROW WALLS and HIGH PLACES
FLOORS & DECKS With 24" or 36" Shaft
INCASING BEAMS or REINFORCING MEMBERS
OR USE AS A SPUD
EASY TO CARRY
a real producer
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MODEL FS-7A
CONCRETE VIBRATOR
Equipped with a 1¼ H.P. Universal, 115 volt motor producing up to 10,000 V.P.M.; double hand grip-skid type base and toggle switch. Available with either 1¾" x 17", or 2" x 10" vibrator head, and shafting in 24", 36" or 7' lengths; quickly attachable wet or dry grinder. Light enough to be easily carried. Powerful enough to be a big producer on a wide variety of construction. Write for details.
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RUGGED-STURDY
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WEARING PARTS FOR DITCHING MACHINES
ALLOY STEEL & METALS CO. manufactures an extensive line of wearing parts for most makes of ditching machines. The material used in the manufacture of these parts is of the highest quality, scientifically alloyed to obtain the longest wearing qualities combined with great strength. Pacific Ditching Machine Parts assure long, dependable service. Expensive down-time is reduced to an absolute minimum.
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Stone for Pavement Produced by Crusher

All Aggregate for Macadam Courses Taken From Local Quarry on Road-Relocation Project in Indiana

+ A STRETCH of State Route 60 in southern Indiana was recently replaced by a new road from Salem, the county seat of Washington County, southeast to New Pekin. The 7-mile project involved grading, drainage structures, an arch bridge, and a surface-treated waterbound-macadam pavement on a compacted aggregate base. The job was done by the Ralph Rogers Co. of Bloomington, Ind., under a $567,460 contract to the State Highway Commission of Indiana. Work got under way in the fall of 1947, and was scheduled for completion in the summer of 1949.

The new road is mostly on new location as it crosses the old 16-foot oil-mat surface 15 times in its 7-mile length. The original road was marked by sharp curves and grades which have been removed in the realignment. The new pavement is 20 feet 6 inches wide and has a center crown of 2¼ inches. It is flanked by 10-foot 9-inch shoulders with a slope of 1 inch to the foot. From the edge of the shoulder 4 feet out and 1 foot down is the side ditch. Backslopes in the cuts vary between 4 to 1 and 2 to 1. On fills up to 4 feet, the side slopes are 4 to 1, while on higher fills they are 2 to 1.

Beneath the macadam pavement is a compacted stone-aggregate base course 21 feet wide which extends out 3 inches on each side beyond the pavement. This first course is 4½ inches thick compacted. On top of it are the two courses of waterbound-macadam stone, each 3½ inches thick, which are topped by a bituminous surface treatment. All the aggregate for the various courses was obtained from a quarry near the north end of the job, where the contractor set up a crushing and screening plant.

Grading

During the 1947-48 winter, the largest structure on the project was completed —a 30-foot arch bridge, 78 feet long. Grading started in April. The earthwork quantities balanced out, thus eliminating borrow material. The deepest cut in earth was 10 feet, and the highest fill was 25 feet. Common excavation totaled 226,741 cubic yards, while solid rock amounted to 35,380 yards. Most of the rock was encountered in one cut with a maximum depth of 35 feet, while the rest was found in cuts from 1 to 10 feet deep.

Blast holes were made with a couple of Ingersoll-Rand wagon drills driven by a Gardner-Denver 315-cfm air compressor and a Sullivan 350-cfm compressor. The holes were spaced 4 to 5 feet on centers and charged with Atlas Gelodyn No. 1 dynamite. An 82 Lorain 2-yard shovel dug out the rock after the blast and loaded it into three 9-yard end-dump Euclids. These hauled it an average of 600 feet to the fills where it was spread out in layers by a Caterpillar D8 dozer.

The dirt-moving was handled by 4 Super C 12-yard Tournapulls on the long hauls averaging 1,500 feet, and by 5 LeTourneau 14-yard FP Carryalls pulled by D8 tractors on short hauls averaging 800 feet. Two D8 push tractors helped to load the hauling equipment, while two other D8 dozers on the fills spread the material in 9-inch lifts. Disk harrows cut up any large chunks, and the fills were compacted by four Huber 10-ton 3-wheel rollers. Final shaping of the roadbed was handled by two Caterpillar No. 12 motor graders. The dirt which makes up the new road is a red clay, and the rock is either a limestone or blue shale.

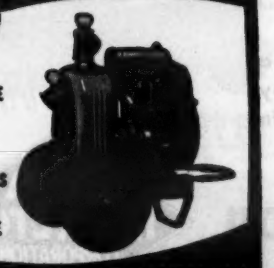
C. & E. M. Photo

Base-course stone is laid on the new 7-mile stretch of State Route 60 in southern Indiana, between Salem and New Pekin. An Allis-Chalmers Model 35 tractor pulls a Jaeger spreader by means of a 30-foot length of double cable hitch. A truck, working between the cables, fills the spreader with from 8 to 10 tons of stone.

Drainage structures include nine concrete culverts ranging in size from small 2 x 3's to a large 12-foot slab. In addition there are 50 corrugated-metal pipe structures under approaches and 90 concrete-pipe structures running through the roadbed; these latter required 6,500 linear feet of concrete pipe

(Continued on next page)

STERLING PUMPS



SIMPLE DEPENDABLE RUGGED
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CHOICE OF LEADING CONTRACTORS
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WRITE FOR LITERATURE

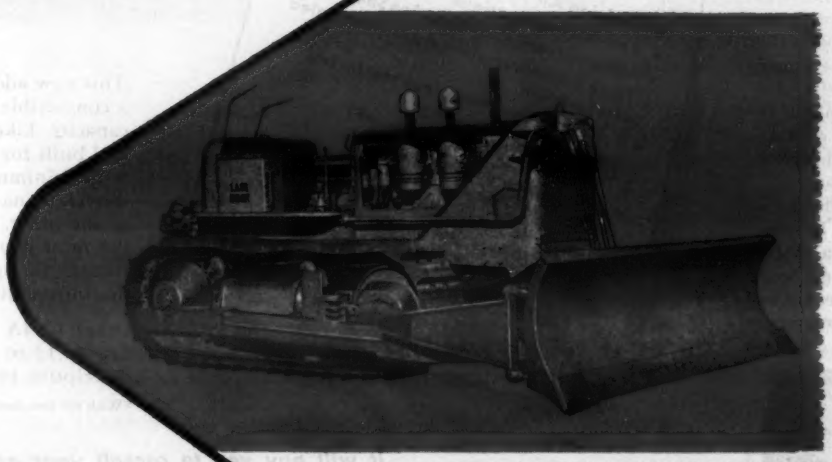
STERLING MACHINERY CORPORATION
405 Southwest Blvd., Kansas City

SOUTHWEST

The new bulldozer and trailbuilder equipment developed by SOUTHWEST for use with Allis-Chalmers HD-19 tractors have proved exceptionally efficient and reliable in all types of operations. These are rugged, dependable units that provide outstanding economy and long service life.

"QUARRY-TYPE"
BULLDOZERS AND TRAILBUILDERS
NOW AVAILABLE FOR
ALLIS-CHALMERS HD-19 TRACTORS

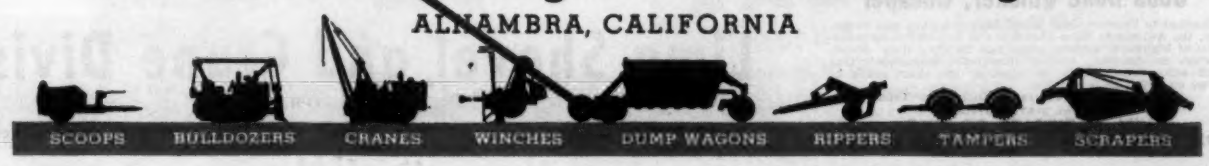
Type "AFB" Bulldozers and Type "AFT" Trailbuilders for use with Allis-Chalmers Tractors.



NOTE THESE FEATURES...
Overhead "A" frame structures entirely eliminated.
New, rugged radiator guard type mounting.
Furnished for either rear or front mounted control units.
Bulldozers can be furnished with either adjustable arms or with side arms welded to blade.

Write For Bulletin CM23

CONSTRUCTION MACHINERY DIVISION
Southwest Welding & Manufacturing Co.
ALHAMBRA, CALIFORNIA



SCOOPS BULLDOZERS CRANES WINCHES DUMP WAGONS RIPPERS TAMPERS SCRAPERS

Stone for Pavement Produced by Crusher

(*Continued from preceding page*)

from 6 to 42 inches in diameter. The pipe was supplied by the U. S. Concrete Pipe & Culvert Co. of Cincinnati, Ohio, and delivered to the job by truck.

Limestone Quarry

In the meanwhile, stone for the pavement was being taken from a blue-limestone quarry only ½ mile from the north end of the job. The rock was taken out in 14-foot lifts, with the holes drilled on 4-foot centers both ways by a pair of Ingersoll-Rand wagon drills. Air was supplied by two Gardner-Denver compressors—a 750 and a 500-cfm unit. The holes were charged with Atlas 60 per cent dynamite, and from 75 to 100 holes were shot in the regular daily blast. A Lorain 2-yard shovel dug out the broken rock and loaded it into three end-dump Euclids. They hauled the rock 700 feet to an older adjoining quarry.

This latter quarry had 30-foot stone faces on three sides, but because of the poorer quality of its stone it was not being worked. Here on the roomy floor of the old quarry the contractor set up his crushing plant where stone for the paving operations was produced at the rate of 225 to 250 tons an hour for a 12-hour day. Altogether nearly 65,000 tons of stone was crushed for use on the highway.

Crushing Plant

The Euclids dumped the quarry rock into a 20-ton hopper which emptied into a Telsmith 30 x 42 jaw crusher. The crusher was belt-driven by a Caterpillar D17000 diesel engine housed under a near-by shed. Under the crusher a Telsmith feeder, operated by a 10-hp motor, moved the material along to the bottom of a Pioneer conveyor belt, 169 feet long x 30 inches wide, which was powered by a G-E 50-hp motor. At the top of this long conveyor the material was split over two Robins 5 x 14-foot sloping vibrating screens, one on either side of the conveyor. Each double-deck screen had its own 20-hp motor. Different screens, with openings of various sizes to meet the gradation requirements of the stones needed, were used with the crusher. The largest screen, with 3½-inch openings, was used on the top deck on both sides.

Oversize material not passing the 3½-inch screen slid down a chute to a Symons 4¼-foot standard cone crusher which was belt-driven by two Caterpillar D13000 diesels in tandem. When smaller-sized stone was required, material not passing the lower deck's maximum 2-inch screen, for example, was chuted down to a Symons 4-foot short-head cone crusher located alongside the standard cone crusher. The short-head crusher was pulled by a D17000 and a D13000 diesel engine, also hooked in tandem. The four big diesels driving the cone crushers were housed under sheds adjoining the plant tower.

The product of both cone crushers dropped onto a Barber-Greene 50-foot return belt conveyor, driven by a 25-hp motor, which threw the stone back onto the main belt. It was then passed over the screens again, and any oversize was chuted down once more to the cone crushers for further processing. Other stone passing the screens was collected into bins according to the sizes of the screens being used. The tower was equipped with three Johnson bins with a total capacity of 300 tons, so three different sizes of stone could be manufactured at one time. Usually the lower decks of the two screens were divided into two different sizes.

The various electric motors that were used in the operation of the crushing plant were powered by a D13000 diesel electric generator set, with another D13000 unit standing by as a spare. The other diesels were also hooked up to 66-kw generators which supplied the plant with electric light current.

From under the bins, trucks collected loads of stone for hauling out to the road. The hauling was done by Howard Crulo of Bedford, Ind., with a fleet of up to 25 trucks holding from 8 to 10 tons each. Payment was made on a ton-haul basis, so on the way from the plant the trucks were weighed on a Winslow beam scale. As nearly half the job output was required for 1-F stone for the macadam courses, from 6,000 to 7,000 tons of this size was stockpiled along the quarry walls. The piles were made by having the trucks drive along the sides of the quarry on top, and end-dump over the walls. Two Haiss loaders were used to load trucks from the stockpiles.

Stone Sizes

The gradation of the various sizes of stone used on the project was as follows:

	Per Cent Retained				
Sieve Size	No. 1-F	No. 63	No. 10-FF	No. 9	No. 12
3-inch	0	....	....	....	....
2½-inch	10-40	....	....	....	....
2-inch	55-100	....	....	....	....
1½-inch	85-100	0	....	....	....
1-inch	95-100	0-5	....	....	....
¾-inch	98-100	10-25	0	0	....
½-inch	....	20-50	0-15	10-35	0
No. 4	....	45-75	20-60	90-100	20-50
No. 8	....	....	50-85	....	65-100
No. 30	....	75-90	70-100	98-100	96-100

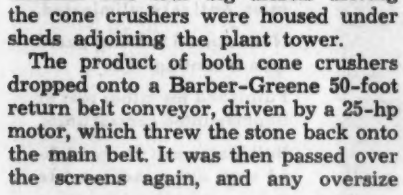
The No. 63 stone was used in the compacted aggregate base; the Nos. 1-F and 10-FF in the macadam courses; and No. 9 and No. 12 for the surface treatment.

Compacted Aggregate Base Course

The No. 63 stone for the compacted aggregate base course was end-dumped from the trucks into two Jaeger adjustable spreaders which worked nearly abreast of each other over the shaped and rolled subgrade. As the 8 to 10 tons of stone was unloaded, one spreader at a time was pulled slowly ahead by an Allis-Chalmers Model 35 tractor by means of a 30-foot length of double cable hitch. This permitted the truck to keep well in back of the tractor, and within the cable on each side, until all the stone was discharged into the spreader box. The next truck along unloaded into the adjoining spreader, which was pulled ahead by the same tractor that had moved from one side of the road to the other.

The two spreaders, working close together, laid the full 21-foot width of

(*Continued on next page*)



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Attached to Tractors, Bulldozers, Motor Graders and Scrapers, the Automatic Slope-Meters are in use on the construction of highways, airports, dams and building sites. Slope-Meters are compact, sturdily constructed instruments that will automatically show the operator the exact grade or slope on which he is working.

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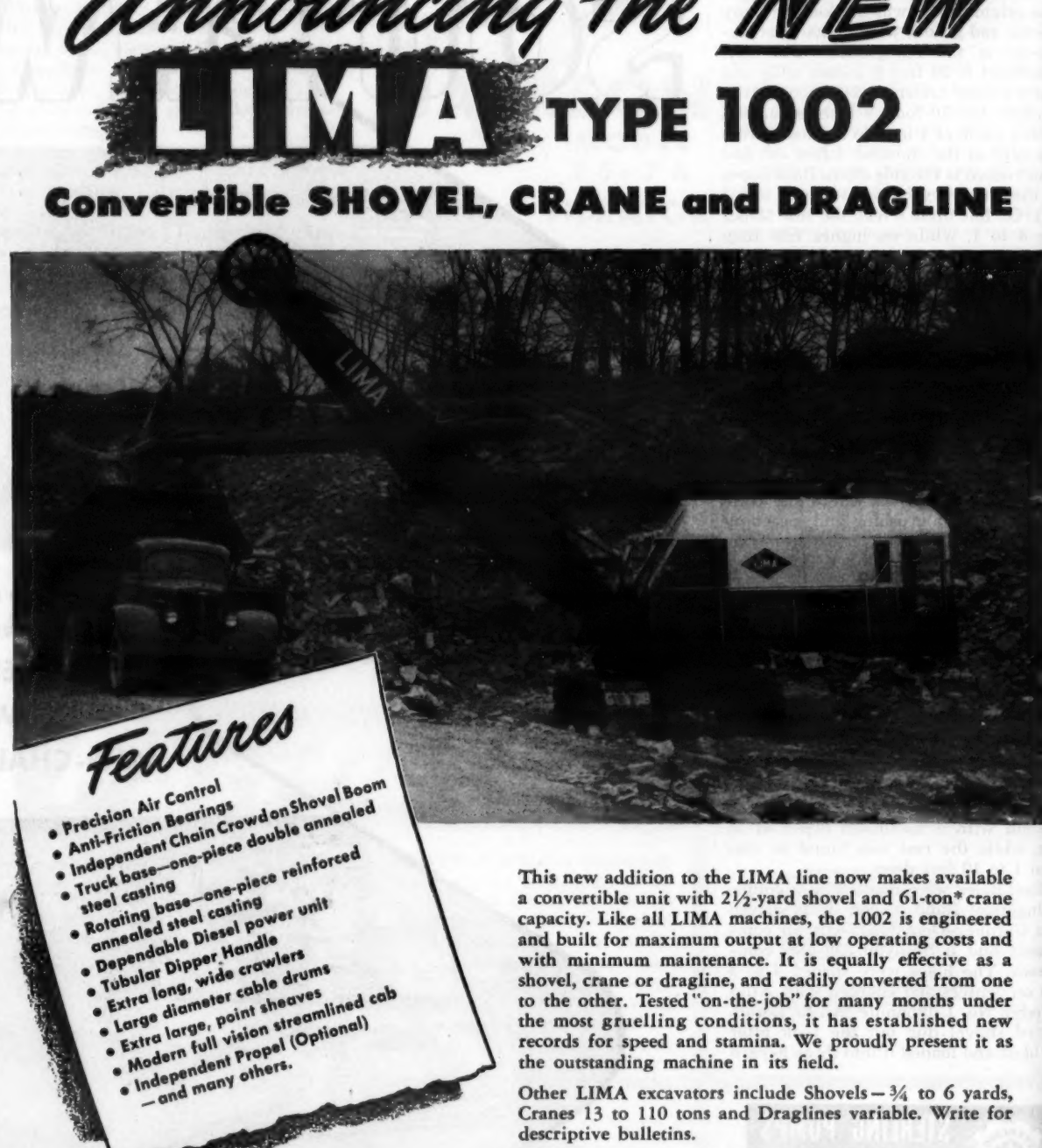
2929 University Ave. S. E., Minneapolis 14, Minn.

Announcing the **NEW**

LIMA TYPE 1002

Convertible SHOVEL, CRANE and DRAGLINE



Features

- Precision Air Control
- Anti-Friction Bearings
- Independent Chain Crowd on Shovel Boom
- Truck base—one-piece double annealed steel casting
- Rotating base—one-piece reinforced annealed steel casting
- Dependable Diesel power unit
- Tubular Dipper Handle
- Extra long, wide crawlers
- Large diameter cable drums
- Extra large, point sheaves
- Modern full vision streamlined cab
- Independent Propel (Optional)

—and many others.

This new addition to the LIMA line now makes available a convertible unit with 2½-yard shovel and 61-ton* crane capacity. Like all LIMA machines, the 1002 is engineered and built for maximum output at low operating costs and with minimum maintenance. It is equally effective as a shovel, crane or dragline, and readily converted from one to the other. Tested "on-the-job" for many months under the most gruelling conditions, it has established new records for speed and stamina. We proudly present it as the outstanding machine in its field.

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It will pay you to consult your nearest Lima Sales Office or representative before you buy your next shovel, crane or dragline. Offices in principal U.S. cities.

Lima Shovel and Crane Division

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LIMA HAMILTON CORPORATION

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C. & E. M. Photos

Two views of contractor Rogers' crushing plant—with the Telsmith jaw crusher in the background, the conveyor, and the Johnson stone bins with screens on top.

base course to a loose depth of 6 inches. This was compacted to 4½ inches by the 10-ton 3-wheel rollers, and also with the assistance of the heavy stone trucks that rolled over the newly laid base stone. Work on this first course started about 1¾ miles from the south end and proceeded south while the grading was being concluded at the north end of the job. By this arrangement, the initial strip of base stone got well compacted by the stone trucks hauling material for the macadam courses which began at the south end of the project.

Waterbound Macadam

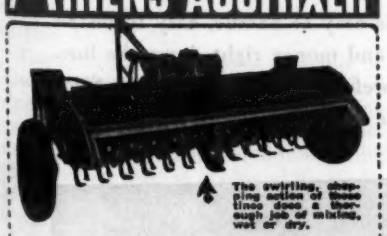
Two Adnun Black Top Pavers, working nearly abreast, laid the No. 1-F stone for the waterbound macadam, which consisted of two 3½-inch compacted courses 20 feet 6 inches in width. They eliminated the hand work usually associated with this type of pavement construction in order to get a smooth course of stone. After the stone was laid, it was given a break-down rolling with the smooth-wheel rollers to key the material together. Then the No. 10-FF stone screenings were tail-gated over the surface and broomed in to fill up the voids between the larger-size stones. This was done with a wire broom drag pulled by a rubber-tired tractor. Again the rollers moved in to compact the dry chips still further into the crevices of the larger stone.

This dry binding was done gradually with successive brooming and rolling until the course was well keyed. Then water was added until the stone course was thoroughly wet and a good soupy grout was produced to complete the binding action. Water was applied from spray bars at the rear of two 1,000-gallon tank trucks, under pressure supplied by 2-inch centrifugal pumps. After a good soaking, the surface was again broomed and rolled. The second course of waterbound macadam was laid in the same manner.

After the macadam had dried out, the top course was primed with 0.34 gallon of MC-1 asphalt to the square yard applied by a Littleford distributor. This was followed by a bituminous surface treatment. The treatment consisted first of applying 0.20 gallon of RC-3 asphalt to the square yard. This was covered with 60 pounds of No. 9 stone per square yard, put on with Buckeye

(*Concluded on next page*)

FOR SECONDARY ROAD CONSTRUCTION...
ARIENS AGGMIXER



The swirling, dropping action of these tines does a thorough job of mixing, wet or dry.

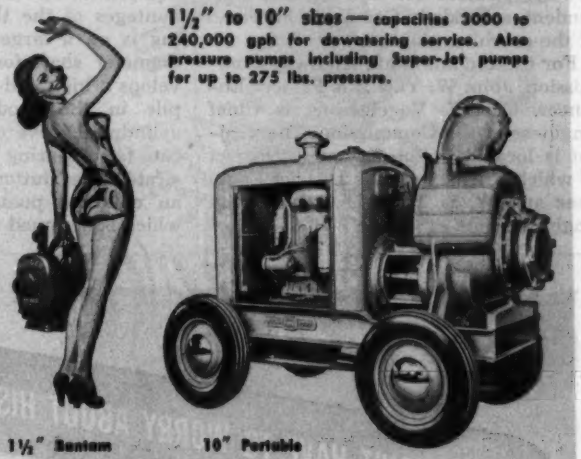
HERE'S equipment designed especially for mixed-in-place construction—to operate in connection with other general purpose equipment. Whatever aggregates are used if thoroughly pulverized, mixes and mellows aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe to ... Made in 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY BRILLION WISCONSIN

JAEGER "Sure Prime" for all pumping jobs

No other pump is built to handle water like the Jaeger "Sure Prime". Two separate, simultaneous priming actions prime it faster and more surely. Extra power in its engine, an ever-tight seal, and water passages 6 times larger than the intake insure the vacuum, capacity and pressure to pump big volume, against higher heads, move water at the lowest known cost per gallon to drain or supply your job.

Overall enclosures, exclusive with Jaeger, insure a dry, quick-starting, smooth running engine in all weather. Close-grained shell castings *armored against wear*, long-life Lubri-Seal always accessible for inspection, adjustable hardened impellers and replaceable liner plates mean thousands of extra hours of service for your money.



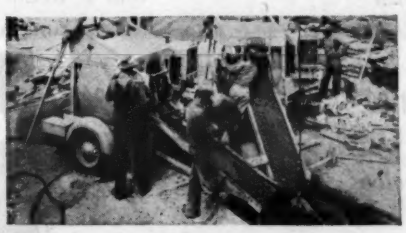
1½" to 10" sizes — capacities 3000 to 240,000 gph for dewatering service. Also pressure pumps including Super-Jet pumps for up to 275 lbs. pressure.

1½" Bantam 10" Portable

"Air Plus" pressure does 4 days' work in 3

Jaeger "new standard" compressors, delivering 15% to 20% more air than old standard ratings set in 1932, operate today's air tools at full pressure (90 lbs. instead of 70 lbs. at the tool), develop their full hitting power and drilling speed, actually do 30% to 40% more work per day.

This 15,000 lb. pile hammer, for example, requires 565 cfm of air at 100 lbs. for top efficiency and gets it from a Jaeger Model 600. Two big wagon drills will drill 30% to 40% more footage with this Model 600 than with any 500 ft. compressor. Other sizes, 75 ft. for one heavy paving breaker, 125 ft. for two breakers, 185 ft. for three, 250 and 365 ft. for larger tools, offer you comparable advantages.



Concrete, Bituminous Mixers

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engineered equipment
Sold, Rented, Serviced in 130 Cities of U. S. and Canada
THE JAEGER MACHINE COMPANY
Columbus 16, Ohio — Cable: BIGANLITE

Stone for Pavement Produced by Crusher

(*Continued from preceding page*)

spreader boxes, after which 0.45 gallon of RC-3 asphalt was applied. This was worked in with a drag maintainer and then rolled. It was sealed with RC-3 asphalt at the rate of 0.15 gallon to the square yard, and covered with 18 pounds of No. 12 stone to the square yard. This final seal was also broomed and rolled.

An average force of 25 men was employed on the project. Other job equipment included a maintenance shop truck complete with small tools, a Hobart 300-amp electric welder, and an oxyacetylene welding set; also a greasing truck for servicing equipment.

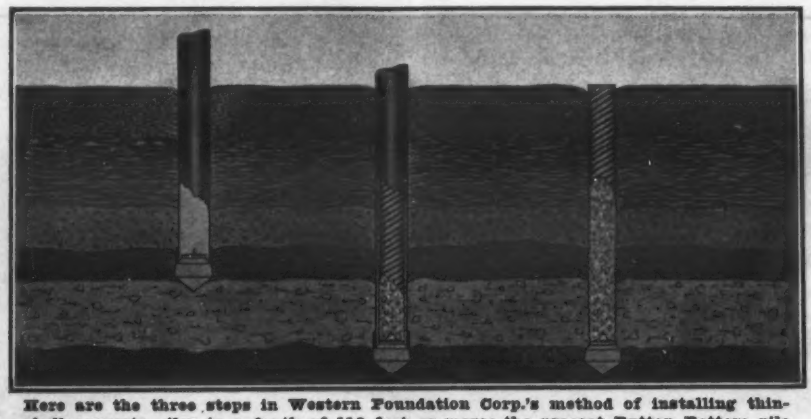
Quantities and Personnel

The major items of the 7-mile road contract included the following:

Excavation, common	226,741 cu. yds.
Excavation, rock	35,380 cu. yds.
Concrete pipe, 6 to 42-inch	6,500 lin. ft.
Concrete for structures	750 cu. yds.
Reinforcing steel	147,116 lbs.
Base stone	24,000 tons
Macadam stone	28,372 tons
Screenings for macadam	18,462 tons
Stone for surface treatment	3,462 tons
Bituminous material for prime	32,307 gals.
Bituminous material for treatment and seal	73,840 gals.

The Ralph Rogers Co. of Bloomington, Ind., was represented on the project by Kenneth W. Wysong, Superintendent, and Edwin Campbell, Foreman of the crushing plant.

For the Indiana State Highway Commission, John W. Yaw was Project Engineer. Carl E. Vogelgesang is Chief Engineer of the Commission. The project is located in the Seymour District of which R. H. Harrell is District Engineer and W. L. King is Construction Engineer.



Here are the three steps in Western Foundation Corp.'s method of installing thin-shell concrete piles to a depth of 110 feet or more: the precast Button Bottom pile is driven, followed by steel casing; a corrugated-steel shell is lowered inside the driving casing; then the shell is filled with concrete and the casing withdrawn.

Thin-Shelled Piles Are Driven 110 Feet

Thin-shell concrete piles are being driven 110 feet deep or more by the Western Foundation Corp., 2 Park Ave., New York 16, N. Y. The previous practical length for this type of pile was 80 feet, Western says, due to the limitation on the height of the pile leads. The new Button Bottom piles are driven by rigs with 90-foot leads.

The company points out that its method preserves the mobility of the equipment, and still maintains the advantages of the thin-shell pile: bearing is on a large point; the 12-inch-diameter shaft for the full depth develops a high end-bearing value of the pile in the good stratum; and the cylindrical drive casing does not indicate false bearing value in weak upper strata. The Button Bottom piles have an enlarged point at the lower end which is designed to relieve the friction on the forming tube during driving operations.

First the precast Button Bottom pile is driven, followed by a steel casing; the corrugated-steel shell is then lowered inside the protective driving casing; finally the shell is filled with concrete and the casing withdrawn, allowing compressed soil to expand and grip the pile shaft.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 75.

Scraper Capacity 9 Tons

Information on the Model D Roadster Tournapull is contained in a broadside issued by R G. LeTourneau, Inc., Peoria, Ill. The Model D is listed as a one-man-operated self-loading dirt-mover with a capacity of 9 tons. It travels at speeds up to 25 mph.

Among its features described in Broadside TP-189 are the positive-ejection scraper, all-weather torque-proportioning differential, 2-speed positive power steer, electric control, and 4-wheel air brakes. The folder contains specifications for the D Roadster.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 82.

JOE DOESN'T HAVE TO WORRY ABOUT HIS BRAKES . . .
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Naylor Pipe

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New York Office: 350 Madison Avenue, New York 17, N. Y.

Here a Coffing hoist jack is used to remove tie rods from concrete forms during the construction of a new building for the Portland Cement Association at Skokie, Ill.

Hoist Jack Is Used To Salvage Tie Rods

Novel uses for jacks keep springing up all the time. One has been described by the Turner Construction Co. of New York and Chicago, which recently used hoist jacks to remove tie rods from concrete forms, with a resultant saving in time, materials, and money. The hoist jack used was manufactured by the Coffing Hoist Co., 800 Water St., Danville, Ill.

The base of the tool was set against the form and the hook affixed to the tie rod. Pressure applied by the jack was then used to force the rod out of the concrete and the form. According to the manufacturer, the jack has enough strength and pulling power to overcome the adhesion of concrete to the rods; and the rods come out in suitable shape for re-use, without the need for tubes or other methods of salvaging.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 62.

Quick-Acting Coupler For Hydraulic Lines

Quick-coupling systems for hydraulic lines are manufactured by The Bruning Co., 1212 P St., Lincoln, Nebr. To couple or uncouple a hydraulic line equipped with them, a slight sliding movement of the locking collar is all that is necessary, the company explains. All lines terminate in valved male nipples and can be coupled in any combination without regard for matching male and female fittings.

These are some of the features claimed for the Bruning units: they can be coupled or uncoupled with pressure on the line and with no loss of fluid; seal action is positive at all working pressures, and valves lock in the full-open position; the locking mechanism is positive, and there is a free swivel action and automatic break-away release. All models of Bruning couplers can also be used on vacuum or air-pressure installations.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 48.

Wrought-Iron Sling Chain

Wrought-iron sling chains are the subject of a catalog issued by The Cleveland Chain & Mfg. Co., 545 Henry St., Cleveland 5, Ohio. Advantages claimed for wrought-iron sling chains, safety rules for their use, and data on their inspection and care are all covered in Bulletin SC-48.

The Sterling chains come in single or double styles, and with various types of rings or hooks. The folder lists recommended load limits for single wrought-iron sling chains and for double sling chains when used at angles of 60, 45, 30, 20, and 10 degrees. It also contains two specification tables listing sizes of chains, coupling links, rings, pear-shaped links, sling hooks, and grab hooks.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 23.

Uses of Sprayer Machine

A folder listing ten uses of the Tarco "direct from the shipping drum" sprayer is available from the Tarrant Mfg. Co., Jumel Court, Saratoga Springs, N.Y. Drawings supplement the text.

The ten uses listed are these: (1) repairing, patching, and resurfacing roads with road oil, asphalt emulsion, tar, or cut-back asphalts; (2) spray-painting operations; (3) spreading concrete-curing liquids; (4) widening or stabilizing road shoulders; (5) applying bituminous seal coats; (6) constructing light-duty pavements; (7) spraying weed-killing compounds; (8) applying insecticides; (9) truck-mounted boom-spraying operations; and (10) applying granular non-skid materials to slippery surfaces. The folder also describes the Tarco tempering tank—a heating unit designed to permit the use of heavier bituminous materials.

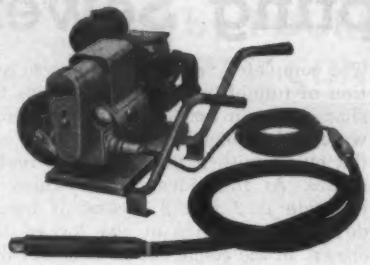
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 98.

LIGHTER . . . EASIER TO HANDLE . . .

you place concrete *FASTER* with a

MAGINNISS

HI-LECTRIC CONCRETE VIBRATOR



WHY? Because there's no flexible shaft! No engine to move! The Generator is set off the job, out of the way. Only a lightweight cable runs to the vibrator. One man operates it, the On-Off switch is at his fingertip. 9,500 VPM with no power loss insures faster and more uniform concrete placement.

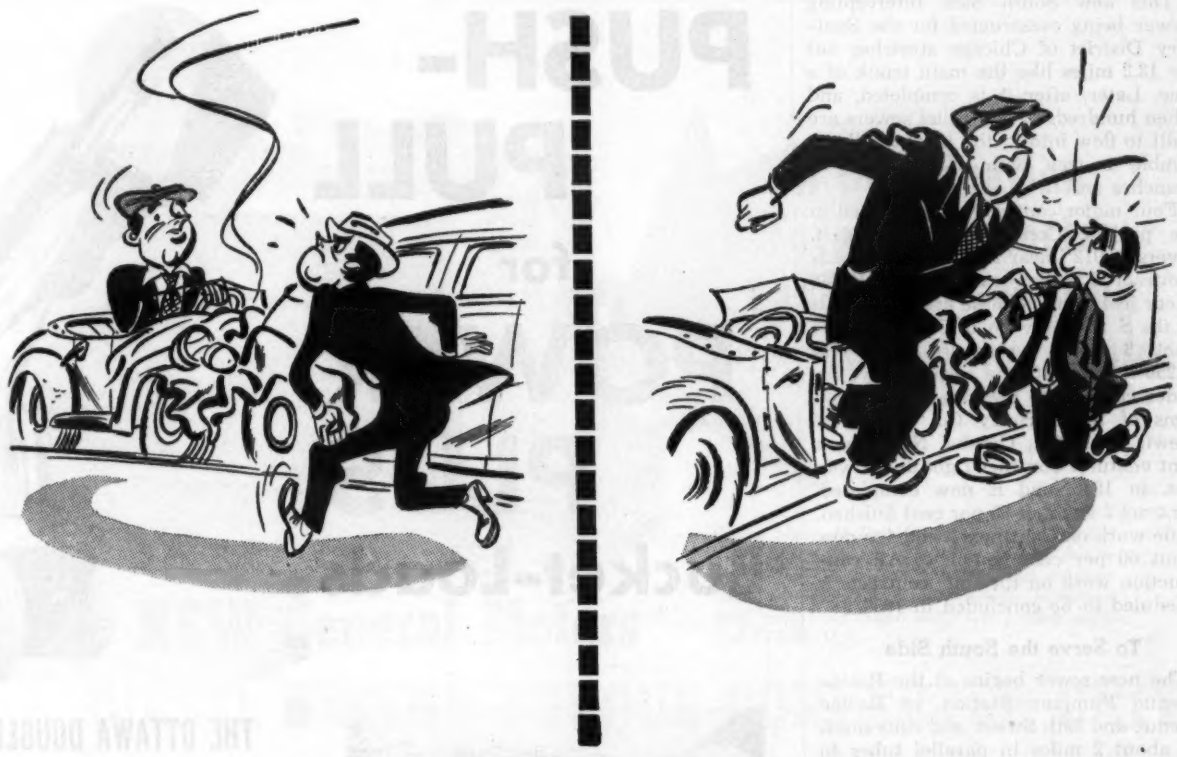
SAFE? Sure, because generator and motors are wound for 110 volt, 180 cycle operation, and are grounded.

—EXTRA FEATURES—

The Hi-lectric Generator operates 2 vibrators, as well as standard floodlights and Hi-lectric Saws and Grinders. Versatility, light weight, low operating and maintenance cost are just a few of the many advantages of Hi-lectric equipment.

Maginniss POWER TOOL CO.

129 DISTL AVE., MANSFIELD, OHIO



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And it's better to know the size of a mixer or paver beforehand, too. Fortunately, you *can* know in advance—definitely and exactly—thanks to the AGC Rating Plate. This plate is your guarantee that the equipment conforms accurately to the requirements of size and capacity set up by the Mixer Manufacturers Bureau.

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Dunellen, N. J.

KWIK-MIX COMPANY
Port Washington, Wis.

THE FOOTE CO., INC.
Nunda, N. Y.

THE JAEGER MACHINE CO.
Columbus, Ohio

THE T. L. SMITH COMPANY
Milwaukee, Wis.

THE KNICKERBOCKER CO.
Jackson, Mich.

Chicago Is Building Intercepting Sewer

Four Contracts Cover 13.2 Miles of Tunnel Being Dug, Braced, and Lined Under Compressed Air

By WILLIAM H. QUIRK,
Eastern Editor

✦ A CONSTRUCTION project worth $42,300,000 is going on practically unnoticed on the South Side of Chicago. The big job remains in relative obscurity because it is a sewer being built far beneath the city streets in a tunneling operation under compressed air. The only visible links with the surface are the work shafts which are fenced in from the public gaze, an occasional inconspicuous emergency lock, or a concrete paver discharging concrete for the tunnel lining into a hole in the street.

This new South Side Intercepting Sewer being constructed for the Sanitary District of Chicago stretches out for 13.2 miles like the main trunk of a tree. Later, after it is completed, and when hundreds of city relief sewers are built to flow into it, the layout will resemble a tree with a multitude of branches and twigs.

Four major contracts are involved in the project. Contract 1, the longest, covers 23,912 linear feet. Next in size is Contract 2 which extends for 16,888 linear feet. Both of these are being built by the S. A. Healy Co. of Chicago. Contracts 3 and 4, which are 15,860 and 13,250 linear feet long respectively, are under contract to the two construction firms of S. A. Healy Co. and Peter Kiewit Sons' Co., Omaha, Nebr., in a joint venture. Contract 1 got under way first, in 1946, and is now completed. Contract 2 is about 95 per cent finished, while work on Contracts 3 and 4 is now about 60 per cent complete. All construction work on the four contracts is scheduled to be concluded in 1950.

To Serve the South Side

The new sewer begins at the Racine Avenue Pumping Station, at Racine Avenue and 39th Street, and runs south for about 2 miles in parallel tubes to Garfield Boulevard and Morgan Street.

The completed reinforced-concrete section of tunnel for this contract has the shape of an inverted horseshoe 18 feet wide and 20 feet high. The bottom is a flat curve with a thickness of 2 feet 5 inches. At the sides the thickness of concrete is 2 feet 9 inches; it tapers down to 20 inches at the top of the crown. In the construction of each tube, a rough 24-foot square tunnel was dug.

Contract 2 starts at the end of Contract 1, and continues east for 2 miles with a single barrel as far as Washington Park. Another barrel extends south from Contract 1 for 1¼ miles to the end of Contract 2. The sewer lines in Contract 2 are the same-size barrels as in Contract 1.

All the work on Contracts 1 and 2 has

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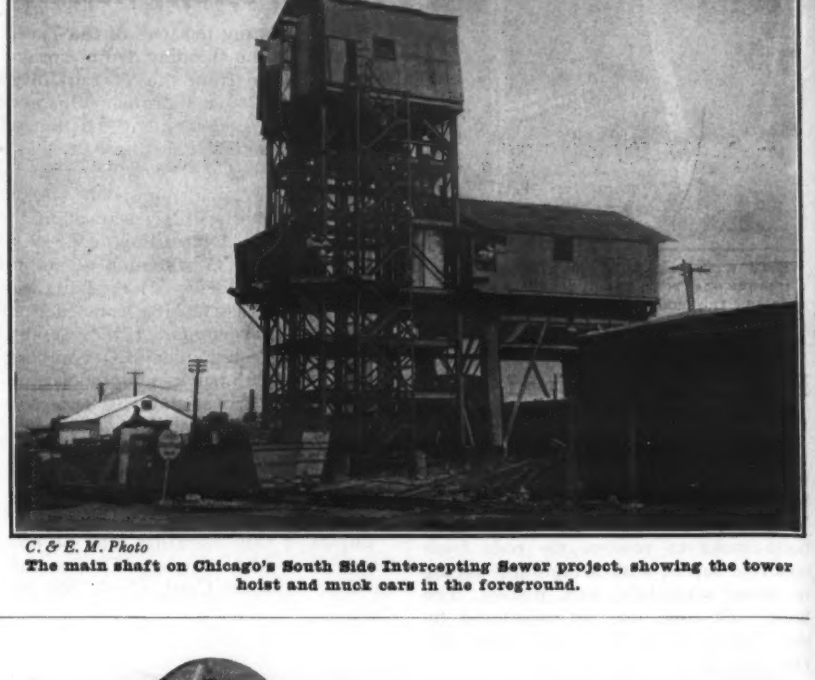

C. & E. M. Photo
The main shaft on Chicago's South Side Intercepting Sewer project, showing the tower hoist and muck cars in the foreground.

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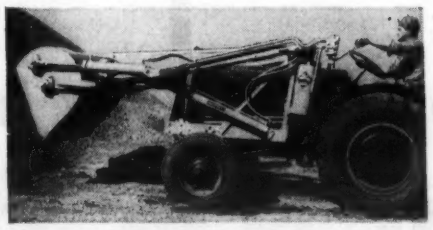
PUSH-PULL for POWER PLUS Bucket-Loads



Hydraulically controlled bucket is shown above at load start position. Double action cylinders are placed in power plus horizontal thrust position. Note powerful triangular construction.

Hydraulic Bucket control permits slow or fast dumping. Loaded bucket can be leveled throughout lifting operation. Start of controlled dump is shown in illustration above.

THE OTTAWA DOUBLE ACTION INDUSTRIAL LOADER

Dual Hydraulic operation throughout. The bucket is hydraulically controlled by a powerful pair of double action cylinders. This feature adds many operational uses never before found in loaders of its price range.

High capacity double action lift cylinders make the Ottawa "Double Action" outstanding in the loader field. Down pressure on lifting cylinders adds excavating to the long list of material handling operations possible with the New Ottawa. Here is a loader that lifts, loads, digs and builds stock piles as well as functioning as a material leveler and spreader.

Now available for following tractors:

Minneapolis Moline RTI—UTI—UTIL
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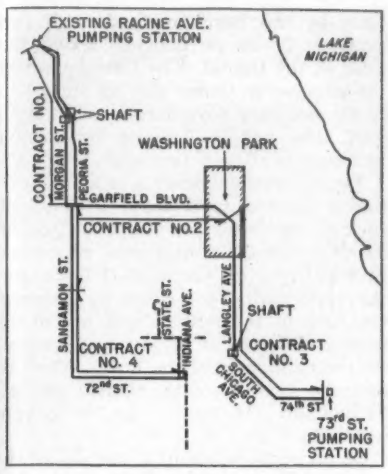
It's new—It's a feature your customers have been looking for—It's low cost—
It's economical — Write today for complete details and price list.

The Ottawa INDUSTRIAL HYDRAULIC FRONT END LOADER

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.



Location of the four contracts for Chicago's new South Side Intercepting Sewer. The $42,300,000 project is scheduled for completion in 1950.

been done from two construction shafts sunk about midway along Contract 1 at each of the parallel barrels. They are located within the grounds of the Union Stock Yards at 46th Street and South Racine Avenue.

Contract 3 continues south and east from the end of the east section of Contract 2, passing under Langley Avenue, South Chicago Avenue, and 74th Street to tie in to the existing 73rd Street Pumping Station. This contract is being worked from a shaft at 69th Street and Langley Avenue. It will meet the Contract 2 tunnel, working from the opposite direction, at a point under Washington Park. Half of the Contract 3 tunnel is an 18 x 20-foot section, similar to Contracts 1 and 2; the remaining distance will have an 18-foot square section except for 700 feet which will be 13 ft square in area.

Contract 4 picks up at the south end of the southerly leg of the Contract 2 tunnel, continuing south on Sangamon Street to 72nd Street, where it turns east and runs as far as Indiana Avenue. The upper half of the tunnel has an 18 x 20-foot section, while the lower half measures 16 feet 6 inches x 18 feet 4 inches. Contract 4 is being partially worked from the shafts at Contract 1, and the balance from a shaft at 72nd and State Streets.

Air Job

The sewer tunnel is being constructed under a fairly shallow cover, with a maximum depth of only about 50 feet. The material varies from a complete earth section to combinations of earth and clay, clay and rock, and finally an all-rock limestone formation. Only a short portion of the tunnel has its entire face in rock. Most of the tunnel excavation was through a medium-hard clay at the top of the bore, with rock at the bottom. A typical cross section of strata at the tunnel discloses that the upper 15 feet from the surface is a mixture of medium-hard blue clay and pebbles. Below that level lies a combination of hard blue clay and stone down to rock, which is from 30 to 50 feet below ground level.

To attempt to dig a tunnel through material too soft to resist the great weight from above required the use of compressed air. Obviously the open-cut system of excavation could not be followed with the sewer line running under the city streets. Air pressures from 8 to 11 pounds per square inch were found sufficient. The greater pressure was needed in the Contract 3 section where the material was softer than that encountered in the Contract 1 or 2 sections, and the cover was less.

The usual procedure in constructing the tunnel is to mine by a heading-and-bench method, excavating the upper half of hardpan and clay with pneumatic digging tools, and the lower rock half by drilling and blasting. The tunnel is lined with rib bracing directly behind the digging, and this operation is followed by the pouring of the concrete walls. The steps follow one another in close succession.

For each foot of tunnel in the 18 x 20-foot sewer section, 17½ cubic yards of excavation is required. For Contracts 1 and 2, from 600 to 700 pounds of steel roof support were installed for each linear foot of excavation. On Contract 3, where the material is softer and the depth not so great, as much as 800 pounds per foot is necessary. The average spacing of the rib supports is 4 feet, but in places where greater strength is required this is reduced to 2 feet. The concrete lining for the walls takes 6 cubic yards of concrete and 350 pounds of reinforcing steel for the average foot of sewer tunnel.

Supplying the Compressed Air

Compressed air for the two Healy contracts No. 1 and No. 2 is sent down the two shafts located midway of Contract 1. Sufficient electrically driven compressors were installed in a shop near the mouths of the shafts to supply 6,000 cubic feet of air per minute at each of the four headings being worked.

(Continued on next page)

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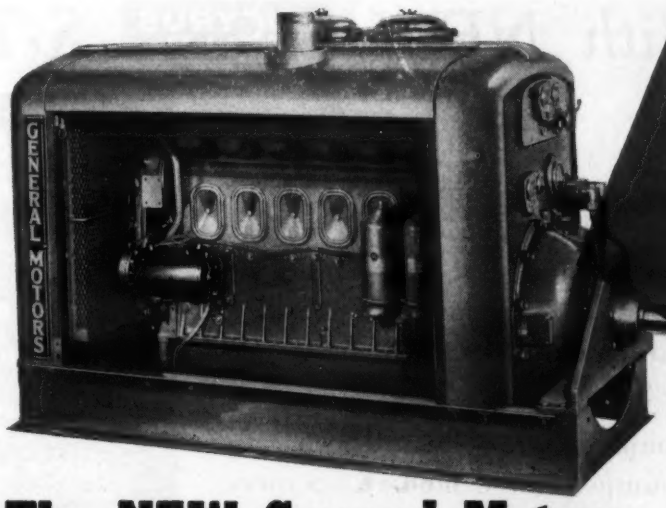
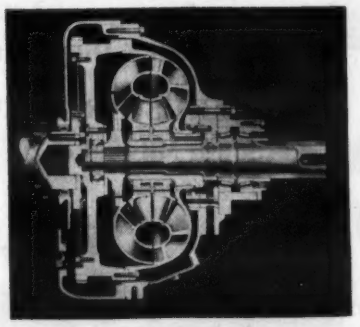


A Combination Torque Converter and Fluid Coupling Integral with the Engine

General Motors 71 Diesels equipped with the new GM Torque Converter take up no more space or weight than the same engines with conventional friction clutch and power take-off. Available in 3-, 4-, and 6-cylinder single engine units, Twin 4 and Twin 6 models having engine ratings from 75 to 300 H.P.

The NEW General Motors
DIESEL ENGINE-TORQUE CONVERTER UNIT

HERE is a complete, integrated Diesel engine-torque converter unit that combines the inherent efficiency of the GM 2-cycle Diesel engine with the features and advantages of *both* torque converter and fluid coupling. It provides *torque multiplication up to 4 to 1* for starting variable heavy loads. It also provides *highly efficient transmission of power* during light load periods by *automatically shifting to fluid coupling* in the upper speed range.



In the new GM Torque Converter, oil does the work. Automatic transition from torque multiplication of 4:1 at stall to 1:1 in upper speed range.

A smooth, uninterrupted flow of power, delivered through a liquid, *prevents engine stalling* under any load and *protects both engine and driven machinery from sudden shocks.*

One Manufacturer—One Responsibility

Up to now most engines and hydraulic drives have been separate units. The result—compromise designs and divided responsibility. Now General Motors offers a new torque converter specifically designed and manufactured as an integral part of the General Motors Series 71 Diesel engine. It is a self-contained unit built by one manufacturer providing a long needed saving in space and weight as well as certain desirable operating characteristics not available before.

This new power unit will get the most work done in the least time because the engine operates in its most efficient speed range at all times—delivering maximum engine horsepower regardless of the speed of the load. *Maximum torque to start heavy loads PLUS maximum horsepower to keep the load moving.*

Everyone with a hard job to do in the oil fields, in construction, in mining or in logging should have all the facts about this compact, flexible GM Diesel Engine Torque Converter unit. *Write today for a complete description.*

DETROIT DIESEL ENGINE DIVISION
SINGLE ENGINES . Up to 300 H.P. DETROIT 28, MICHIGAN MULTIPLE UNITS . . Up to 900 H.P.
GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER

Chicago Is Building Intercepting Sewer

(*Continued from preceding page*)

Both high and low-pressure units are needed; high-pressure air runs the excavating tools, while the low-pressure air fills the tunnel to support the earth above, repel ground water, and prevent cave-ins.

The low-pressure compressors, eleven in number, are either Chicago Pneumatics or Ingersoll-Rands. Their total capacity is 14,850 cfm which they supply at pressures up to 15 pounds per square inch, although the average working pressure is between 8 and 11 pounds. The individual ratings of these low-pressure units are as follows:

1 at	2,950 cfm =	2,950 cfm
1 at	2,000 cfm =	2,000 cfm
2 at	1,750 cfm =	3,500 cfm
1 at	1,000 cfm =	1,000 cfm
6 at	900 cfm =	5,400 cfm
	Total	14,850 cfm

The high-pressure air is supplied chiefly by six units with a total capacity of 8,700 cubic feet per minute. It is delivered to the heading at the rate of 120 psi. The high-pressure compressors are individually rated as follows:

5 Chicago Pneumatics	at 1,500 cfm =	7,500 cfm
1 Ingersoll-Rand	at 1,200 cfm =	1,200 cfm
	Total	8,700 cfm

In addition the contractor has several stand-by or auxiliary compressors (Chicago Pneumatics, Gardner-Denvers, Ingersoll-Rands, and Joys) with ratings of 250 to 500 cfm.

The low air leaves the compressor house for each heading in two 12-inch pipes which are reduced to 6-inch pipes when the tunnel bulkhead is reached. The two high-pressure pipes are similarly reduced from 10 to 6-inch-diameter lines.

The air locks are built into the steel bulkheads, which are placed within about 800 feet of the shafts. As a safety measure, emergency locks with a connection to the street are located within 1,000 feet of the heading. These are advanced to keep within each reach of the heading as the work progresses. Thus if an emergency develops at the heading, the miners do not have to travel back a mile or more to the shaft in order to get out of the tunnel. They can exit by climbing up a manhole to the surface level, where they pass through the emergency air lock to the street.

Tunnel Excavation

Excavation at the tunnel heading is done by the bench method, with two separate levels or benches above the floor of the tunnel. The total length of the excavation under way at these two levels averages anywhere from 30 to 50 feet. The height of these two bench headings is about 6 feet each.

C. & E. M. Photo

To line a section of the Chicago sewer tunnel, a Ransome 34-E paver discharges concrete to a Rex Pumperete, which pipes it down through a hole in the street.

Typical excavation of a mixed face—that is one with hard clay at the top and rock at the bottom—involves the use of hand-held pneumatic spades, either Ingersoll-Rand or Gardner-Denver, for the upper half. Drill holes for blasting the rock at the bottom half are made with jackhammers of assorted makes. As the drilling from the lower bench is entirely vertical with shallow holes, neither drifters nor wagon drills are necessary.

On an average, about 15 miners work on the upper bench, digging out the hard clay with the pneumatic spades. The excavated chunks of material are tossed onto a Joy chain flight conveyor, supported on an overhead trolley beam which is hung from the steel roofing

(*Continued on next page*)

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For any make of machine
Motor Graders, Maintainers, Scrapers, Dozers, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

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Completely new from drawbar to push bumper, these modern scrapers are job-proved to give you faster loading, forced rolling ejection, low-centered stability, positive flotation. Get the full story on their plus performance from your International Industrial Tractor Distributor. 123T48

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Some features that make Bucyrus-Erie S-Type Scrapers stand out and stand up:

DROP CENTER FRONT AXLE — Provides level pull.

LARGE LOW PRESSURE TIRES — Insure maximum flotation.

HINGED APRON — Opens B-I-G for sticky material. Easily converted to conventional opening.

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STRUCK CAPACITIES

S-46	4 cu. yd.
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B-170	15 cu. yd.
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C. & E. M. Photos

Dick Nowicki (left), Engineer Assistant of the Chicago Sanitary District, prepares to enter the emergency lock at 55th and Wallace Street. Peter Garrity (right), Safety Engineer on the 4 to 12 shift of the Chicago sewer-tunnel job, holds an MSA self-rescuer which carries a half hour's supply of oxygen. Over his shoulder is an MSA Explosimeter for testing gas, and on the table is a McCAA oxygen mask.

ribs. This upper-level conveyor runs out beyond the end of the top bench and drops the clay onto a similar conveyor, also hung from the roof but at a lower level between the two benches. When the material falls off this latter conveyor, it piles up on the floor of the tunnel ready for the mucking operations. This air-driven conveyor system gets the excavated material quickly away from the faces of the benches and gives the miners more room in which to work. It also permits the mucking operations to proceed along with the digging.

Drilling, Blasting, and Mucking

Jackhammer drilling on the lower bench is done with drill steel in lengths up to 12 feet, using bits from 1½ to 1¼ inches in size. Holes are drilled on 4-foot centers to an average depth of 11 feet. They are charged with about 17 sticks of Hercules 3XA 45 per cent dynamite, using eight delays, with the 0 primer at the center of the pattern. A typical blast includes about 30 holes. Explosives are brought down into the tunnel in a special car divided into two compartments. The smaller compartment, which takes up one-third of the space, holds the caps, while the larger compartment contains the dynamite. Firing is done from a point 500 feet back from the heading. The average results are one cubic yard of material for ¾ pound of dynamite.

The muck, consisting of the blasted material and that brought back on the conveyor, is shoveled up from the floor of the tunnel by electrically driven Conway mucking machines. Eight of these muckers are on the job—one at each of the four headings, and one back in each tunnel as a spare ready to work in case of a breakdown. They operate off a 440-volt line.

The muckers load the muck into 4-yard cars which are pulled by Goodman storage-battery electric locomotives on a 24-inch-gage track. The tunnel is wide enough to accommodate a main track and siding about 100 feet back from the heading, so no cherry picker or car passer is required to interchange the empty and loaded cars. From this siding the empty car is pushed up to the heading by hand. When loaded, it is pulled back to the siding by a cable hooked to an Ingersoll-Rand air tugger.

Trains of from 10 to 16 muck cars are hauled through the tunnels to the bottom of the 50-foot shaft. There they are raised to the top of the tower hoist over the shaft by a Haughton electric elevator. Each of the two cages in the dual shaft accommodates two muck cars. The cars are pulled off the cage by an I-R air tugger onto a platform from which they are emptied. The platform contains barrel-type unloaders with angle irons around the sides which frame into channels at the sides of the muck cars. As the cars are thus held in a tight grip, the barrels are turned upside down and the muck is discharged into a hopper.

(*Continued on next page*)

BACK-RIP SCARIFIER

RIPS in your dead-head time when backing for new load.

BACK-RIPPING Saves Contractors TIME, MONEY and EQUIPMENT.

Hinged teeth assemblies mount on back of Bulldozer moldboards.

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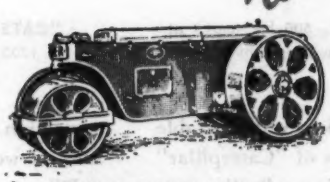
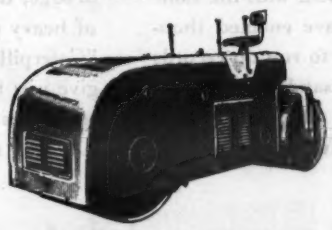


HUBER 3-WHEEL ROLLERS
4 models—5 to 12 tons



HUBER TANDEM ROLLERS
5 models—3 to 14 tons

Put the versatile Huber Maintainer to work on your new construction or maintenance program. It will "pay off" by doing cheaper and faster the many odd jobs and maintenance work now tying up heavy equipment. It's a money maker in its own right—ideal for road, street and airport construction and upkeep. With its 32 HP. engine and 18 miles per hour speed the Maintainer really covers the job. With its hydraulically operated attachments it is readily converted to a bulldozer, patch roller, rotary broom, lift loader, snow plow, berm leveler or mower. Ask any Huber owner about the Maintainer—he'll vouch for its dependability, long life and all-'round performance.

Other Huber road machinery built to make your construction work more profitable includes: 3-wheel automotive type road rollers, tandem rollers and trench rollers. Write today for descriptive bulletins and name of your Huber dealer.

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HUBER *3 Wheel • Tandem* ROAD ROLLERS *and* MAINTAINERS

Chicago Is Building Intercepting Sewer

(*Continued from preceding page*)

From the hopper it is dumped into railroad gondola cars stationed on a standard-gage siding. It is then hauled 20 miles to a quarry at McCook, Ill., where it is wasted in a deep hole. Two Koehring cranes mounted on gantries unload the railroad cars, which are then returned to the siding at the tunnel shaft for another load of muck.

Tunnel Lining

As fast as the tunnel is excavated, it is supported with steel ribs and plates supplied by the Commercial Shearing & Stamping Co. of Youngstown, Ohio. The average spacing of ribs is 4 feet except where excessive loads are encountered, such as at a bridge or grade crossing above the street, where the spacing is reduced to 2 feet. The ribs are 20-pound H-beams. Between the ribs, and for about two-thirds the spread of the arch, liner plates of ⅛-inch gage are installed. Erection of this bracing system is started right up in the heading immediately in back of the miners who are excavating, and at once gives the workers adequate protection against roof failures.

The steel ribs are divided into sections which are erected individually and then bolted together. Four miners in the very front of the heading at the upper bench set up the A1 section of the center arch at the top. This portion is raised on jacks to hold it in place. Below that are three separate sections of rib on each side. About 12 feet behind this first installation, the upper B1 split-haunch members are erected by a miner and mucker, two on a side. Farther back, about 16 feet, one miner and two muckers on a side place the lower B1 split haunch, which is the next member down the rib. The final side member up from the tunnel floor is known simply as the leg, and is the last to be bolted to the rest of the rib. As the heading is pushed forward, the various segments of the ribs are connected with bolts, the liner plates are fitted between the ribs, and the tunnel is protected from cave-ins in the roof.

Reinforcing steel for the concrete wall lining of the tunnel is supplied by the Carnegie-Illinois Steel Co. of Chicago. Working from a scaffold, the steel setters wire the reinforcing rods to the ribs at the top and sides. They also lay the concrete pipe line on top of the reinforcing bars in preparation for the concreting operations that follow. The ribs and the liner plates are, of course, embedded in the concrete.

Safety Measures

Safety engineers are assigned by the contractor to each of the three 8-hour shifts, and the latest safety equipment is always available both in the tunnel and in the Safety Department headquarters near the main shaft. Within the tunnel, fire hose are located 300 feet apart. A 3½-inch water line through the tunnel supplies the hose; water can be pumped out of the tunnel through a 3-inch exhaust line. In addition, all types of fire extinguishers are on hand.

At each heading are 50 Mine Safety Appliance self-rescuers in case a fire should break out or gas fumes develop in the tunnel. These are small metal containers which supply the individual with a half hour's supply of oxygen through a nose clip. The container is carried in the hand. Thus if the air supply is cut off by fire or fumes, the workers are given sufficient oxygen to reach an air lock and safety.

Rescue squads of seven men are also organized and trained for just such emergencies. They are supplied with McCAA oxygen masks connected to a container which is carried on the back and which holds a 48-hour supply of oxygen. MSA Explosimeters are used to test for gas at the headings before the miners resume work after a blast. Trained nurses are on duty round the clock in the first-aid station near the shaft.

Electric lines are installed with great care to prevent the possibility of a short circuit. A 2,300-volt line enters the tunnel where it is stepped down through a transformer. The transformer is moved ahead as the work progresses. A 220-volt light line is carried along the side of the tunnel with a 100-watt bulb every 100 feet. A separate 220-volt line is hung for the blasting operations. Before the drill holes are loaded, the lights at the heading are turned off, the miners withdraw behind the steel form carrier, and the blaster and dynamite men go up to the heading equipped with miners' lanterns on their caps. Tests are made for short circuits, and the lead line from the holes is brought back 150 feet from the heading to tie in to the relay. The blast itself is shot off from a point 500 feet back from the heading.

Concreting Operations

Concrete for the walls of the sewer is mixed on the street above the tunnel in Ransome 34-E dual-drum pavers. Dry batches, three to a truck, are delivered to the paver by the Material Service Corp. of Chicago, which employs from eight to ten trucks for hauling the material. Water for the mix is tapped off fire hydrants. The mixed concrete is discharged into the bucket running on the 45-foot boom of the paver. The boom is raised at a 35-degree angle so that the concrete can be dumped into the hopper of a Rex Pumpcrete machine which also is stationed in the street.

Beneath the Pumpcrete a 12-inch-diameter hole has been drilled with an auger through the pavement, and down through the ground to the top of the tunnel. Into this hole an 8-inch pipe is fitted, and the surrounding space filled in with grout. The pipe is sealed and left that way until the concrete is ready to be admitted. The holes are placed about 500 feet apart so that the concrete has only to be pumped a maximum of 250 feet. The invert is poured first, directly onto the floor of the tunnel, with a form only at the end. The latter consists of a two-section steel bulkhead

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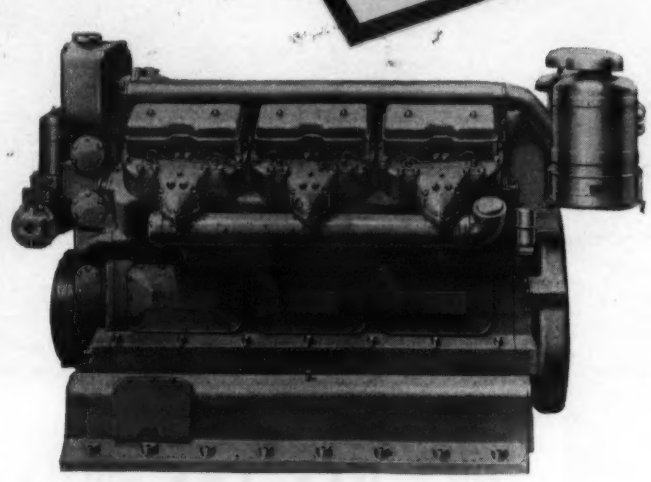
...STILL

WHEN YOU THINK OF INDUSTRIAL AND CONSTRUCTION POWER, THINK OF THE BIG YELLOW ENGINES THAT SUPPLY SO MUCH OF IT



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Now you can power your larger machines with available new-size engines that extend the range of "Caterpillar" Diesels to 500 horsepower. These bigger "yellow engines" are designed, built and job-tested with the same exhaustive thought and care that have enabled thousands of their older family members to run up records of forty, fifty and even seventy thousand hours of dependable operation. They have the same ruggedness, the same efficient fuel system and fuel economy, the same high all-round quality that have made "Caterpillar" Diesels world famous for low lifetime cost-per-hour.

When you need a bigger or more powerful shovel, dredge, ditcher, crusher, asphalt plant, or other piece of heavy power equipment, specify these bigger yellow "Caterpillar" Diesels. Let your "Caterpillar" dealer give you full information on these new engines. He is as near as your telephone.

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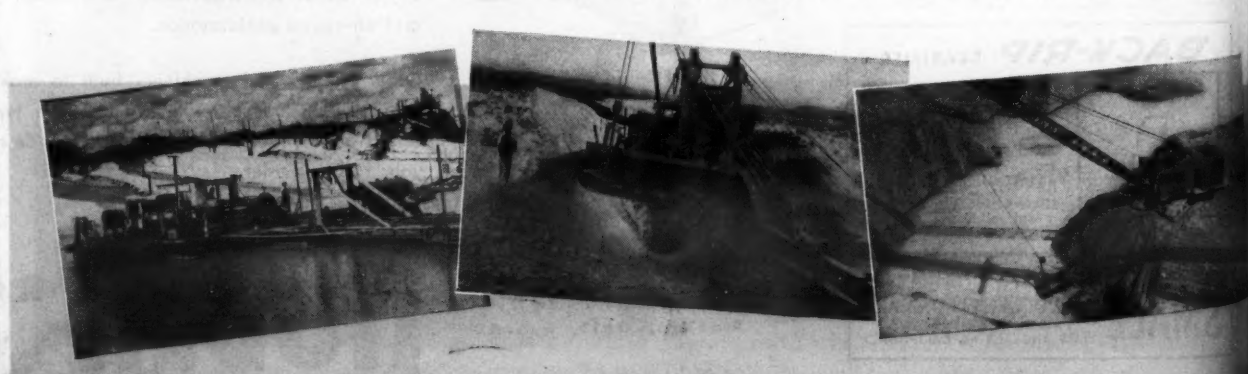


which is bolted together. Tubular metal horses support the 8-inch pipe line during the pouring of the invert, which is 2 feet 5 inches thick at the center.

Blaw-Knox steel forms in 50-foot sections are used for the sides and roof of the sewer pour. The form ribs are on 5-foot centers and are hinged both at the top and sides. The form section is raised and adjusted by means of a hydraulic jack under each of the four legs at the corners, and spreaded jacks along the sides. It moves along by sliding on rails, and is pulled into position by an air tugger. At the sides are hinged windows for vibrating the concrete as it is placed, and also for inspecting the pour.

The usual procedure is to pour a 50-foot section of invert and follow it with the arch and sides. The concrete discharge pipe runs over the top of the form, and as the material leaves the end of the line it is blown into the crevices by a high-pressure air hose. At the top the lining is 1 foot 8 inches thick, but this increases gradually to a thickness of 2 feet 9 inches at the sides, 6 feet above the invert grade.

Grouting

While the overbreak over the entire job is being kept to the minimum, grouting is employed to fill in any openings running back into the ground from the tunnel lining. This operation is done from within the tunnel by drilling 2-inch holes in the roof of the tunnel at short intervals. Through these holes a grout mixture of one part of cement to three parts of sand is blown at a pressure of from 30 to 50 psi. Water for the mix comes out of the 3-inch tunnel pipe line, while the air is tapped off the high-pressure air line.

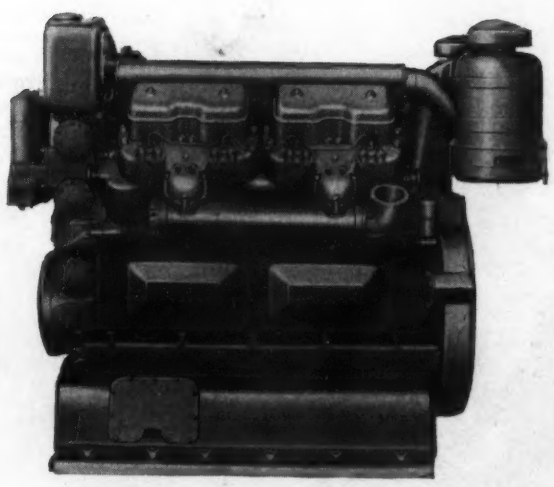
Personnel

The S. A. Healy Co. has employed a force of around 700 men during the construction on Contracts 1 and 2. An additional 700 were added when operations got under full swing on Contracts 3 and 4. Healy personnel on the project includes Mark A. Foote, Engineer; William Ragland, Superintendent on Contracts 1 and 2; Michael Healy, Superintendent on Contract 3; and Merle R. Miller, Contract 4.

For the Sanitary District of Chicago, Joseph H. Richmond is Resident Engineer on the South Side Intercepting Sewer project. The Sanitary District is headed by William H. Trinkaus, Chief Engineer.

BIGGER YELLOW ENGINES ...FOR YOUR LARGER JOBS

"CATERPILLAR" DIESEL D375 ENGINE—335 hp. (max.) at 1200 rpm. V-8—5¾" bore x 8" stroke. Equipped with blower.



"CATERPILLAR" DIESEL D364 ENGINE—265 hp. (max.) at 1200 rpm. V-8—5¾" bore x 8" stroke.

Will T-H Law Definition Of Professionals Be Kept?

The Taft-Hartley Law definition of professional employees and its provisions distinguishing them from non-professionals should be retained, urged the Engineers Joint Council at a recent public hearing. The hearing was held by the Senate Committee on Labor and Public Welfare. The Council is a joint committee of the five major engineering societies.

The engineers pointed out that the Taft-Hartley Law defines professional employees and gives them statutory protection for the first time. (Under the Wagner Act, they were subject to National Labor Relations Board interpretations.) The engineers stated that under the Wagner Act no distinction was made between the professional and non-professional, in spite of the fact that "their viewpoints and abilities are inherently different and that their conditions of employment cannot be made subject to a common standard".

The Council pointed out that under the old law, professional employees were included, often against their will, in heterogeneous groups, and compelled to accept representation which they did not desire in collective-bargaining procedure.

The Council explained, "It is futile to expect that a forced grouping of professional and non-professional employees could possibly form an 'appropriate bargaining unit'. Under the old law and its administration, such plainly inappropriate groupings were made and, by fiat, were declared appropriate."

Lift-Truck Grip Arms

Gripping arms for use with fork-lift trucks are announced by the Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14, Ohio. These steel arms are designed to grab and hold securely large oil drums, barrels, rolls of concrete-curing paper, and other cylindrical objects. They are for use with the Elwell-Parker revolving load-carrying attachment.

Surfaces that contact the roll are padded with rubber to prevent marring or damage. The clamps are hydraulically operated and will hold loads of up to 2,000 pounds. In all-electric trucks, the pump for the hydraulic system is engineered into the clamping device. In trucks equipped with hydraulic lifts, the same pump serves to operate the clamps.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 29.

Truck-Mixers, Agitators

Chassis for mounting truck-mixers are described in a 12-page catalog available from The White Motor Co., 842 E. 79th St., Cleveland 1, Ohio. This catalog features a description of how to match the mixer and truck to meet specific concrete-hauling problems.

Catalog F-1113 tells how to locate the center of gravity of a truck chassis and how to determine its gross vehicle weight during mixer operations. It lists recommended White models for use with the various sizes of mixers, and it tells how to select the proper size of engine, rear axle, and transmission for a specific set-up. The catalog also lists most of the truck-mixers presently available, with data on their capacity, weight, minimum dimensions required for the chassis, and the distance from the front of the mixer to the center of gravity.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 69.

Portable Crushers Made in Two Sizes

Two new plants have been added to the line of crushing and screening equipment made by The Universal Engineering Corp., Division of Pettibone Mulliken Corp., 620 C Ave., N. W., Cedar Rapids, Iowa. The Model TS-16 is a small portable unit specifically designed for small jobs where specifications are not too rigid, and where larger plants are impractical. The other model, a larger secondary crushing, screening, and loading plant, has a capacity of from 60 to 100 cubic yards of minus-1-inch material per hour, and requires 125 hp to operate.

In the TS-16, gravel is delivered to the hopper over a mechanical feeder, and then to the screen where the oversize is removed and passed to the crusher. The fines passing through the screen are delivered by chute to the loading conveyor. As the oversize is crushed, it goes to the delivery conveyor and is not returned to the screen for grading.

The plant consists of a bar grate which rejects boulders too large for the crusher; a clutch-controlled reciprocating feeder; a 2 x 3-foot roller-bearing gyrating screen mounted at an incline between the feeder and crusher; a by-pass chute which delivers fine material to the loading conveyor; a 10 x 16-foot Universal roller-bearing overhead eccentric force-feed crusher; an 18-inch x 20-foot delivery conveyor; a goose-neck truck with pneumatic tires; and a 35 to 40-hp gasoline or diesel-engine power unit. The TS-16 has a capacity of from 30 to 60 tons per hour. It is controlled from a special platform from which the operator has full view of the entire plant, the manufacturer points out.

A feature of the large plant is the 30-inch TwinDual roll crusher. This is a 2-stage reduction machine consisting of two double-roll crushers mounted on a single set of shafts and bearings. One set of rolls receives the coarse material coming from the top deck of the screen, and acts as a roughing crusher. According to the manufacturer, about 50 per cent of the material going through this crusher is crushed to finish size. The second set of rolls acts as the finishing machine. These TwinDual rolls relieve the jaw crusher of much of the primary crushing.

Plant equipment includes a 4 x 12-foot 2½-deck vibrating screen, three 30-inch conveyors, a 25-inch plate feeder, a Rotovator (revolving elevator) and a rubber-tired chassis. All principal drives are through V-belts. The plant is portable within height and weight limitations.

Universal's new secondary crushing, screening, and loading plant features a 30-inch TwinDual roll crusher. Crushing capacity of the plant is 60 to 100 cubic yards of minus-1-inch material per hour.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 1.

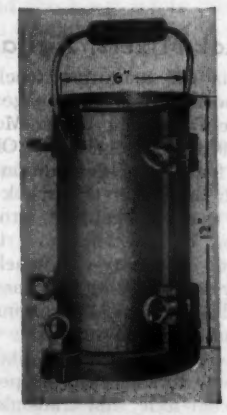
Tips on How to Obtain Longer Service From Pumps

A catalog called "How to Get Longer Service From Your Pumps" has been issued by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. It discusses four factors which affect pump life and performance—corrosion, corrosion fatigue, erosion, and wear—and tells how the selection of certain metals or materials can increase the life and efficiency of pump parts.

The booklet illustrates several case histories in which pump service was improved in the handling of sewage, brackish harbor water, and grit and other abrasive materials. It describes the type and size of pump used; the reasons that this pump was chosen; how it was failing to provide the desired results; and how the application of special metals to certain parts extended the performance value of the pump.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 26.

MOLINE CONCRETE TEST CYLINDER MOLD



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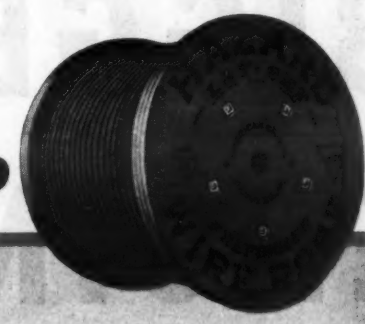

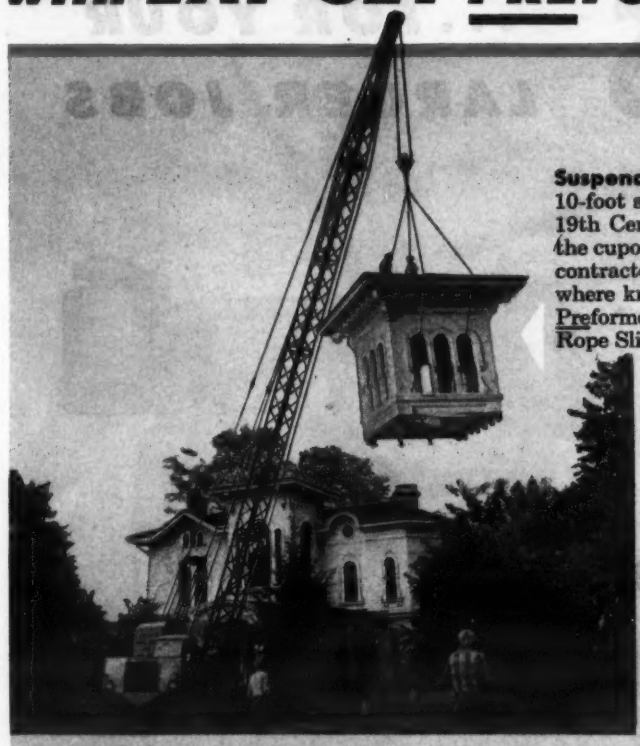

Suspended between heaven and earth is this 4-ton, 10-foot square cupola which enhanced the beauty of a 19th Century building. Serving only as an ornament, the cupola was finally condemned. Here was a job for a contractor with the right equipment. Contractors everywhere know that the *improved performance* of LAY-SET Preformed Wire Rope . . . and Acco Registered Wire Rope Slings . . . makes any job easier . . . reduces costs.

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New Concrete Slab Resurfaces Old One

Job Involves Widening And Some Reconstruction; Experience Gained May Modify Future Practice

By W. F. ABERCROMBIE, Engineer of Materials and Tests, Georgia State Highway Department, Atlanta, Ga.

✦ AN old concrete section of Route 21 in Chatham County, Ga., a few miles northwest of Savannah on the Augusta road, has been resurfaced with portland-cement concrete. Experience obtained on this job may possibly modify Georgia Highway Department practices on similar future jobs—particularly with respect to placing expansion joints, removing bituminous skin patches on the old slab, and wetting the old slab before placing the concrete resurfacing.

Decision to Resurface

Built in 1920 and 1921 with portland-cement concrete, the old pavement consisted of a 16-foot concrete slab 5½ inches thick at the edge and 6 inches thick at the center. It was too narrow to accommodate the increasing volumes of truck and passenger-car traffic. Moreover, it was considered structurally inadequate for the heavy loads operating over it. But since a considerable portion of the old road was at a desirable location and on desirable grades, and since it was still in reasonably good condition, the Highway Department decided to utilize as much of the old pavement as possible by building a concrete resurface.

The old road would have to be widened, and certain sections containing sharp curves or rather abrupt changes in grade would require reconstruction. But the contractor could perform the resurfacing, widening, and constructing of new sections in one continuous operation, utilizing the same methods.

Accordingly, plans were made to construct a 22-foot concrete road, utilizing the old slab where possible and new location or grade where considered desirable.

Design of Project

A minimum thickness of 5 inches of concrete resurfacing was used on the project. This was determined after calculations by various methods in common use had shown that a 5-inch thickness of concrete resurfacing would be adequate. The condition of the old road was evaluated in making this determination.

The 6-foot widening was to be divided usually into a 3-foot strip on each side. However, provision was made to vary this width from a maximum of 4 feet to a minimum of 2 feet—the use of at least one foot of widening seemed desirable for strengthening purposes. The widened section was to be a uniform 8 inches in thickness. This extra thickness on the edge of the concrete resurfacing was planned to function as a thickened edge and to protect against edge breakage.

In some of the early concrete-resurfacing projects in other states, it was recorded that special reinforcing methods were used along the line where the widened portion overhangs the edge of the old slab. But it was later noted that no cracks tended to occur, and that no special treatment was therefore required. Consequently, no special treatment was designed for this project.

Joints

At the time the Chatham County project was designed, the standard procedure in Georgia was to place expansion joints in concrete pavements at 300-foot intervals, with contraction joints at 20-foot intervals. As far as possible, this jointing arrangement was used in the design of the resurfacing and widening.

The expansion joint was specified to be the full depth of the old pavement and the new concrete resurfacing. This was to be accomplished during the concrete-resurfacing work by removing the old pavement completely for a distance of 3 feet on each side of the new expansion-joint location. A new expansion joint at each 300-foot interval was to be installed, and concrete was to be placed to the full depth of old and resurfacing slabs in one operation.

In the concrete resurfacing, the design required that contraction joints be located over each old expansion joint and, in addition, midway between. Expansion joints in the old pavement were spaced at some 40 to 60-foot intervals with no intermediate contraction joints, and this was taken into consideration in the spacing of the new contraction joints. In general, the contraction joints in the concrete resurfacing were spaced at 20 to 25-foot intervals. In a few cases, this meant that

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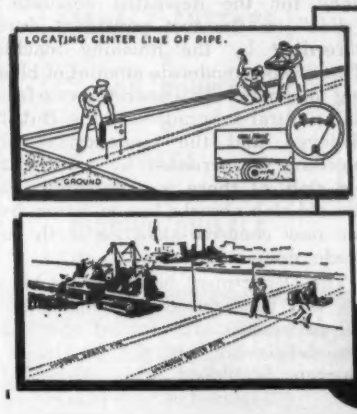

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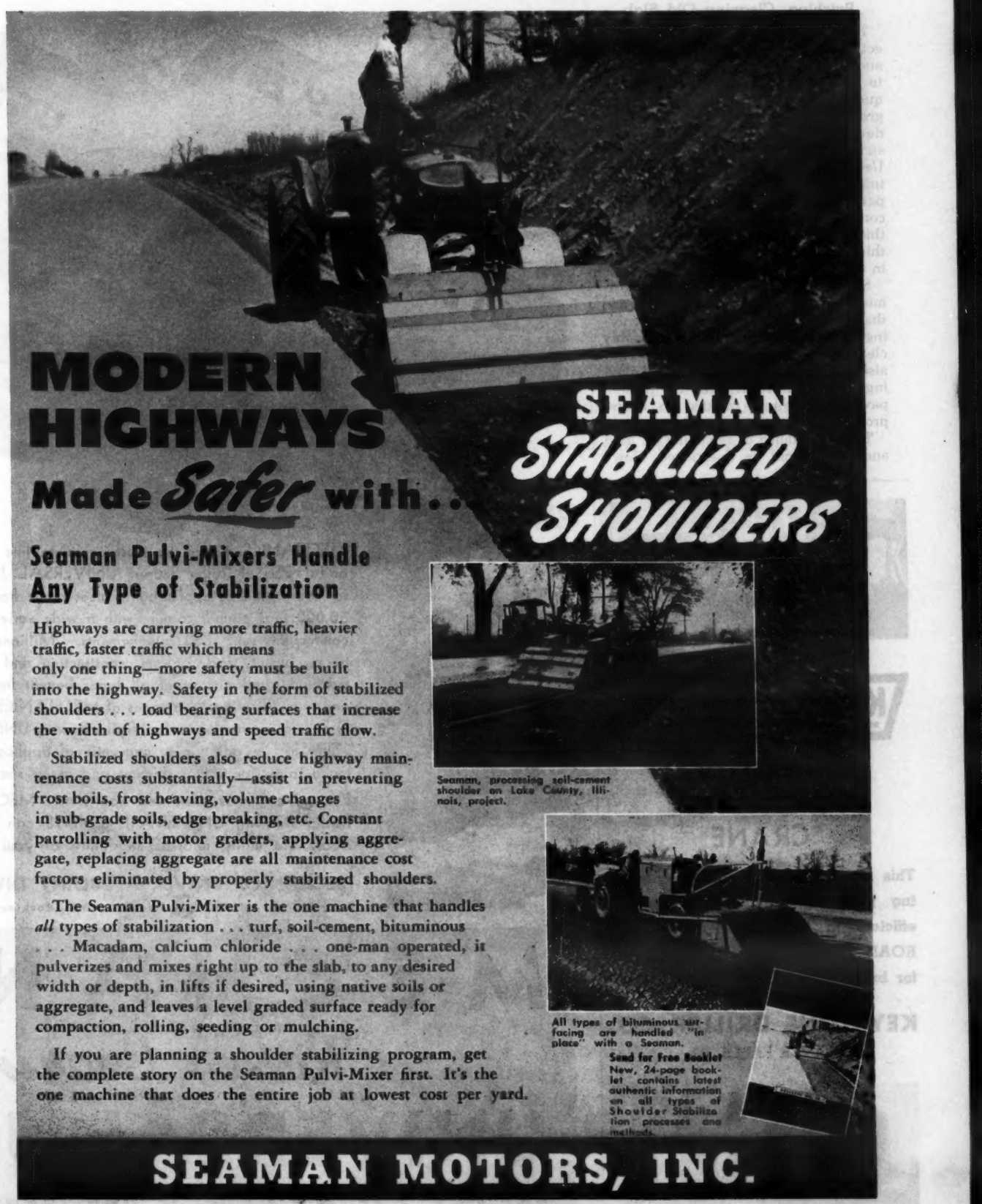
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Stabilized shoulders also reduce highway maintenance costs substantially—assist in preventing frost boils, frost heaving, volume changes in sub-grade soils, edge breaking, etc. Constant patrolling with motor graders, applying aggregate, replacing aggregate are all maintenance cost factors eliminated by properly stabilized shoulders.
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282 North 25th St., Milwaukee, Wis.

New Concrete Slab Resurfaces Old One

(*Continued from preceding page*)

two contraction joints were installed between adjacent expansion joints in the resurfaced sections.

Considering the cost and the difficulty of installing expansion joints properly, consideration will be given on future projects to eliminating expansion joints completely, except at bridge ends—although experience to date indicates that the design used has proved satisfactory. If expansion joints are eliminated on future projects, contraction joints will be placed over old expansion and other joints, and as further required, to divide the pavement into slab lengths of 15 to 20 feet. With the long spacing or elimination of expansion joints, and the short spacing of the contraction joints, dowels would not be considered necessary; it is believed that adequate load transfer can be secured through aggregate interlock.

Patching, Cleaning Old Slab

During the early stages of the project, badly broken areas were removed and patched with concrete. This proved to be a rather costly operation of questionable value. As the job progressed, any shattered areas that were developed by the operation of construction equipment were left in place. Usually these areas were depressed under the level of the surrounding pavement, with the result that the concrete resurfacing at these points is thicker than elsewhere, the added thickness making up for any deficiency in the old pavement.

Specifications required that all bituminous skin patches be removed, and that the old slab be swept with revolving and hand brooms and thoroughly cleansed by hosing with water. They also stipulated that "just prior to placing of concrete resurfacing the present pavement shall be wetted to insure proper bond".

The importance of removing all mud and dirt cannot be questioned. However, the removal of bituminous skin patches seems to be an unnecessary refinement. Whether or not this provision will be incorporated in future projects is questionable.

The matter of wetting the slab prior to placing the concrete is another item that should be examined in the light of past experience. There was a tendency for the deposited concrete to "slide" on the wet pavement during screeding by the finishing machine. There was a moderate amount of bleeding on both the concrete-resurfacing and natural subgrade sections. But it is believed that the tendency towards bleeding is increased by wetting the old slab, as there is a possibility that the old slab absorbs less moisture from the new concrete than an earth subgrade does.

The Department believes that bleeding will be reduced to a minimum if old pavements are cleaned of all dirt and debris but are dry at the time concrete is placed. This should also

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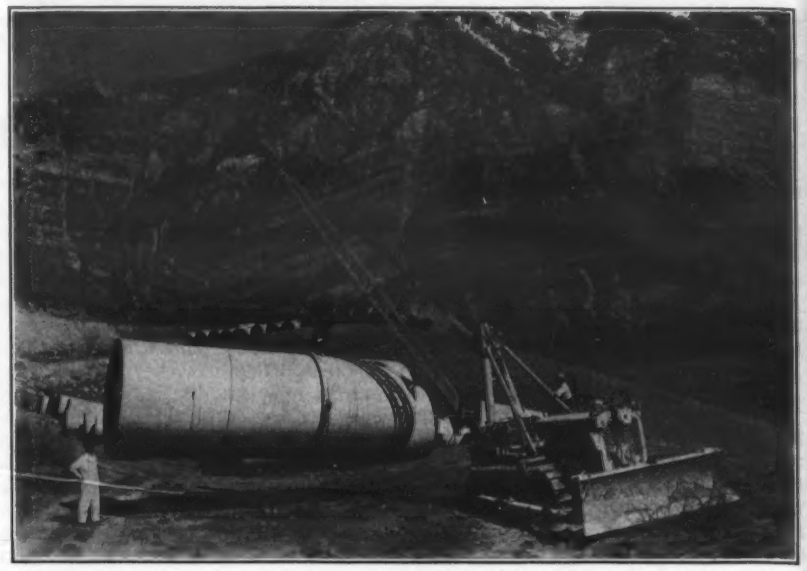

In Provo Canyon, Utah, a Caterpillar diesel D8 tractor and Hystaway install 8½-foot steel pipe to replace a wood flume. With this equipment, Morrison-Knudsen Co., Inc., was able to install about 30 sections, weighing 3 tons each, a day.

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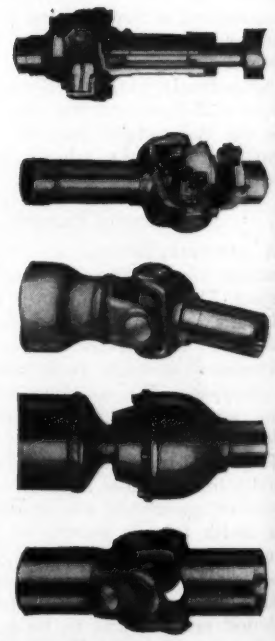

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reduce any tendency for concrete to push ahead of the transverse screed of the finishing machine.

It should be mentioned that there were no cavities due to pumping under the old slab. If there had been any, provision would have been made to fill these cavities by mud-pumping or some similar method of re-seating slab ends.

Paving Operations

Inasmuch as the dummy-groove longitudinal center joint, the tie bars, and the transverse contraction joints of the dummy-groove type were all placed from the surface of the new slab, it was not necessary to place any joint assemblies or chairs on the old slab. No dowels were used across joints, and the only steel items in the concrete resurfacing were ½-inch deformed tie bars placed across the dummy-groove longitudinal center joint. This steel was placed by hand just ahead of the second pass of the finishing machine. Header boards at construction joints were held in place by diagonal braces.

On new location regular paving methods were used. Sandy loam was placed as subgrade material to a thickness of about one foot, as insurance against pumping under heavy traffic loads. This also permitted batch trucks to haul under practically all weather conditions.

As an approach was made to a concrete-resurfacing section, the old shoulders were cut down 2 to 3 inches and forms were set. Changing from a normal subgrade to a concrete-resurfacing section involved little lost motion during concreting operations. About the only change was in preparation of subgrade, which, of course, was not required on the concrete-resurfacing portion except in the widened area.

Payment

Payment for the concrete-resurfacing section was on a cubic-yard basis, but because of the difficulty of measuring the average depth of the concrete, the volume was determined by batch count and by computing the solid volumes of the cement, water, and fine and coarse aggregate. Payment for 8-inch uniform pavement was on a square-yard basis.

This project, 4.1 miles in length, was completed during the summer of 1947. A recent inspection after a year of use by traffic showed that no cracks of any kind have developed. Close observations of the overhang of 3 feet and the concrete in the vicinity of the expansion joints fails to show that any stresses have developed. No intermediate cracks have occurred between contraction joints, and the riding qualities of the road are excellent. However, the project is too new for any long-range conclusions to be drawn.

From a paper presented at the Highway Research Board Annual Meeting in December, 1948.

Coupler for Trailers

Trailer and implement couplers are made by the Acme Mfg. Co., 1406 Agnes Ave., Kansas City, Mo. They come in 8 models and are designed to meet every coupler requirement as to size and style.

These are some of the features of the Acme couplers: a reinforced neck and base on the ball; a lock washer and cotter pin through the bolt for added security; tubular construction, with the sides of the opening tied together directly behind the socket to prevent elongation and loosening of the ball; a patented locking mechanism designed for one-hand operation; an automatic safety lock; reinforced ribs running from the base mounting to the head of the coupler to increase tongue-weight capacity; springs of high-grade spring steel; and heavy construction at drawbar stress points.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 3.

Data on Hydraulic Dozers

Hydraulic dozers for use with Caterpillar D4 tractors are manufactured by the Wm. Bros Boiler & Mfg. Co., 1057 Tenth Ave., S. E., Minneapolis 14, Minn. Bulletin BD-2 shows the Power-Plus dozer mounted on the tractor and in the raised, normal, and down-pressure positions. Other photographs point out the various features of this dozer when used in combination with the D4 tractor.

Dozer features treated in detail in the bulletin include the trunnion rams, positive lock, fantail moldboard design, and engineered design of the blade. The LaPlant-Choate hydraulic power unit, which can be front or rear-mounted, is also described in detail. Specifications listed in the folder cover overall length and width, the distances above or below ground at which the blade will operate, height of blade, maximum tractor-shoe width, and weight.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 12.

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Convention Calendar

April 20-23—ASCE Meeting

Spring meeting, American Society of Civil Engineers, Biltmore Hotel, Oklahoma City, Okla. Col. William N. Carey, Executive Secretary, 33 W. 39th St., New York 18, N. Y.

June 17-July 1—ASTM Meeting

Annual meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J. C. L. Warwick, Executive Secretary, 1916 Race St., Philadelphia 3, Pa.

Building-Workers' Status Discussed in Reports

Instability of employment in the world's construction industries is the subject of a study conducted by the International Labor Office. The results of the study which have been made public in a statement issued from Geneva, indicate that the construction industries may be expected to play a large part in world economy, and that a prime aim of governments should be to stabilize the output of this vital industry.

The ILO warns of the danger of a worldwide housing boom such as occurred after World War I. It also lists an 8-point plan by which governments can take steps to stabilize world construction.

The group also reports on the status of building workers. The shortage of skilled building-trades mechanics is less acute, it points out, than immediately after the war. From 5 to 10 per cent of the total working population is employed in construction. The United States has the greatest total, with more than 2,300,000 building workers.

Complete details on the ILO reports and recommendations have been compiled in booklets available at a cost of 35 cents each. One is entitled "Instability of Employment in the Construction Industries"; the other, "Recruitment and Training in the Construction Industries". Copies can be obtained by writing to the ILO at 1825 Jefferson Place, Washington 6, D. C.

Welding-Practice Guides

Two informative pocket-size welding bulletins have been issued by the Hobart Bros. Co., Hobart Square, Troy, Ohio. One is entitled "How You Can Cut Costs and Add Profits"; the other is a "Guide to Better Welding".

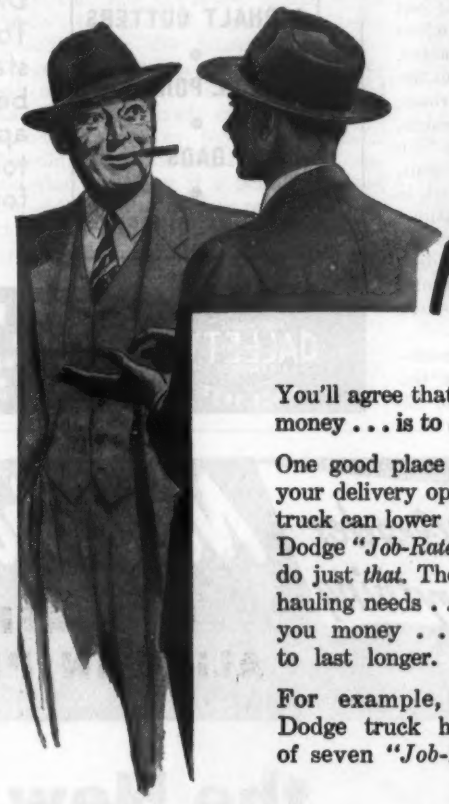
The first Bulletin, DM-758, lists various types of welding operations and indicates the hours required to complete each one, the profit possible on the job, and the amount which the customer will save if he uses arc welding instead of other methods. The bulletin also describes the complete line of Hobart welding equipment and accessories.

Bulletin EW-126 contains information on proper welding practice and gives several useful hints on how to obtain better welds. It explains the three types of welding electrodes, four essentials of proper welding procedures, type of joints, typical positions, the relationship between the electrodes and the metal being worked, standard steel shapes, and the common causes of welding troubles and what to do about them. The booklet also includes engineering data on converting fractions to decimals, making other mathematical and geometrical conversions, standard welding symbols, and the physical characteristics of several Hobart electrodes.

Copies of this literature may be obtained from the company, or by using the enclosed Request Card. Circle No. 46 for Bulletin DM-758, and No. 47 for "Guide to Better Welding".

Hyster Representative

Francis W. Vigneault, Jr., is named District Representative for tractor equipment by the Hyster Co. He will be stationed in the eastern division. Mr. Vigneault was formerly connected with the Caterpillar Tractor Co.



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One good place to watch costs is in your delivery operation. For the *right* truck can lower delivery costs plenty! Dodge *"Job-Rated"* trucks are built to do just *that*. They're built to *fit* your hauling needs . . . save you money . . . and to last longer.

For example, every Dodge truck has one of seven *"Job-Rated"* truck engines. It is a high-compression engine of advance design . . . which insures maximum efficiency, with "top" economy.

Each has exactly the right clutch, transmission, rear axle, and every other unit . . . *"Job-Rated"* for maximum dependability, and long life.

Let your Dodge dealer tell you the whole *"Job-Rated"* story. You'll quickly realize his story makes sense! And remember . . . *only* Dodge builds *"Job-Rated"* trucks.

For the good of your business—

Switch to "Job-Rated" DODGE TRUCKS

CLOSING POWER Plus WHEN AN OWEN BUCKET Clamps Down

It's the "Plus" features in a product that contribute largely to outstanding performance and build user satisfaction and profits.

Relax and swing an Owen from your boom. Closing Power PLUS is there when required for licking the toughest excavating jobs which will confront you.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

THE OWEN BUCKET CO. 9330 Breakwater Ave., Cleveland, O.

BRANCHES: PHILADELPHIA • CHICAGO • BERKELEY, CALIF.

BUY ★ U.S. ★ SECURITY BONDS NOW!

Tower Machine Builds A New 3.8-Mile Levee

Substandard Embankment On Mississippi Replaced In Dirt-Moving Operation Of 1,970,000 Cubic Yards

✦ ANOTHER substandard Mississippi River levee has been replaced by a new, higher levee with a greatly increased cross section for 3.8 miles near Harrisonville, Ill., about 30 miles below East St. Louis. This is another step in the general flood-control program of the Department of the Army, Corps of Engineers, and was under the supervision of the St. Louis Missouri Engineer District. A feature of the work was the use of a tower machine in building the embankment, which required 1,970,000 cubic yards of dirt.

A contract for the construction of the levee was awarded to the Sternberg Dredging Co. of St. Louis, Mo., in February, 1948, on a low bid of $578,990. Subsequently the job was sublet to Luhr Brothers, Contractors, of Columbia, Ill. It was scheduled for completion in February, 1949, but was finished October 14, 1948.

The project is part of the Harrisonville and Ivy Landing Drainage and Levee District located in Monroe County, Ill., on the east bank of the Mississippi River. Its 20,000-foot length runs from station 898+00 to 1098+00, or about opposite miles 141 and 145 on the Mississippi above the mouth of the Ohio River. This particular levee district has a frontage of 21.4 miles along the river and protects an area of 27,800 acres of flat land stretching eastward until higher ground is reached. The region is made up primarily of farms, with a few small towns and important grain elevators also situated in it.

The work was authorized by the Flood Control Acts of 1936 and 1938 which called for new levees not only in this district but in the adjoining districts to the south—Fort Chartres and Stringtown. Together the three districts extend for 34.5 miles along the river, and their continuous levee system protects 46,500 acres. The levees in this entire reach are being reconstructed. Some are finished; others are under construction; while contracts for the remainder are soon to be awarded. The war had long delayed this important work of flood protection.

New Big Levee

The original levee, replaced under this contract, had been constructed by local levee boards back in 1903. It had been subject to frequent overtopping. Recent floods include those of 1943, 1944, and 1947 when the river broke over and through the levee to cover the district with water. After each flood the embankment was always repaired, but only up to its original height which varied from 5 to 10 feet above the existing ground. The average elevation of natural ground in the vicinity of the levee is 388.

The new levee averages 20 feet in height above natural ground. It has a new grade elevation of 409.1 at the north or upper end which decreases to elevation 407.7 at the lower or south end of the contract. Both river-side and land-side slopes are 1 on 4 as they drop down from the 20-foot levee crown width. A typical levee section has a land-side berm 50 feet in width and from 5 to 6 feet in depth, with a 1 on

(Continued on next page)

C. & E. M. Photo

This is the head tower of the Bucyrus-Erie tower machine used in building the new section of levee near Harrisonville, Ill. In the background is a portion of completed levee. At right is the borrow pit.

ALL "SET" TO SERVE IN 72 HOURS with Fulco COTTON Concrete-Curing MATS

Fulco Cotton Concrete Curing Mats save taxpayers money by increasing the life of roads during the first 72 critical hours, when concrete is setting and curing. Fulco mats stay wetter longer with less water, insulate fresh concrete from sudden temperature changes. They're preferred and approved for state and Federal highway construction, because they cure concrete better and quicker.

FULCO MATS USABLE MANY, MANY TIMES

The per job cost of using Fulco Cotton Mats is negligible, because they can be used again and again. Sturdily made with tough cotton fabric with stitched edges and seams, Fulco mats are filled with cotton padding weighing 12 oz. per sq. yd. Edges are stitched on a 6" flap along the long side to assure complete overlap from mat to mat.

Every contractor needs Fulton Triple-Strength Tarps of 1,000 uses, for protecting machinery and supplies from elements of the weather.

Write for Price List.
Address Nearest Factory Branch.

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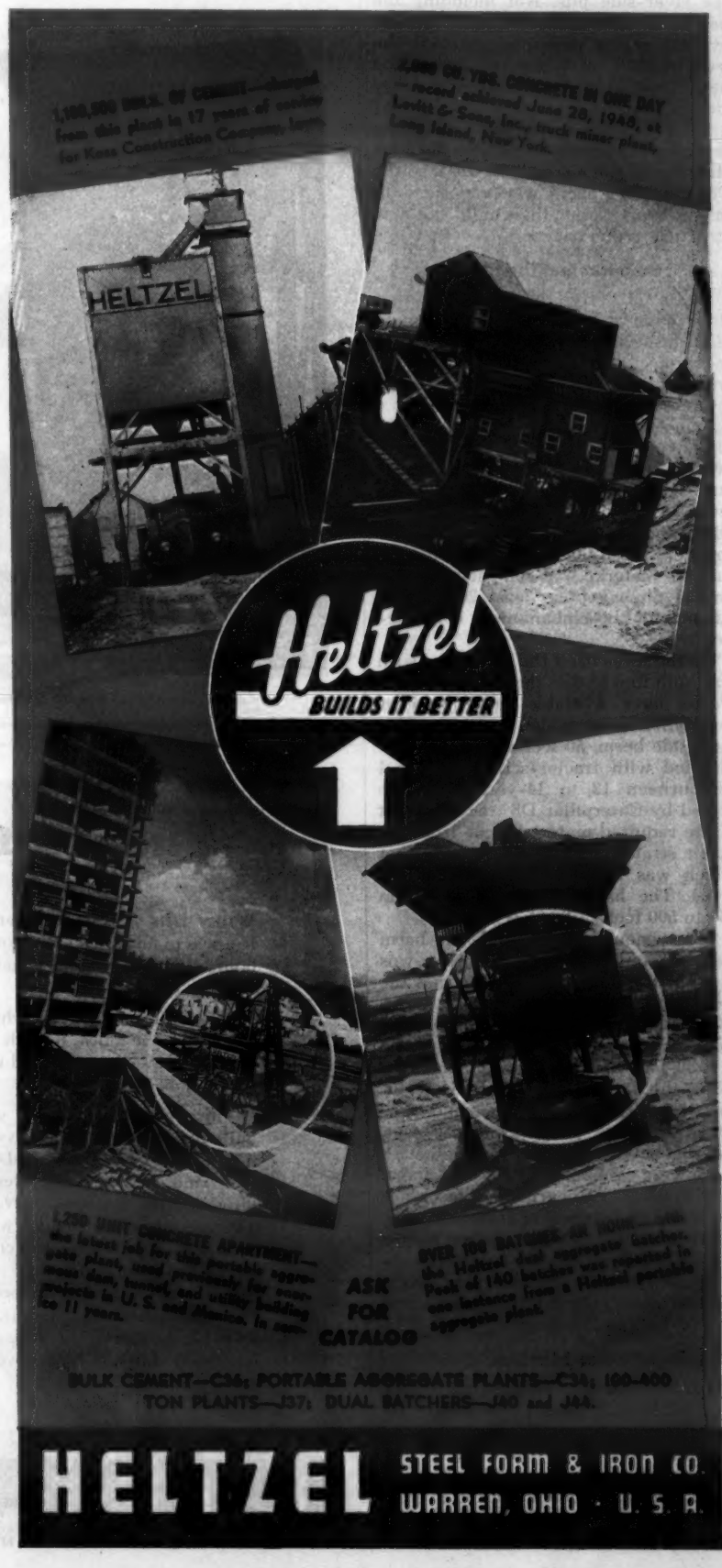
Kansas City (Kans.) • Minneapolis • New Orleans • Los Angeles • New York, 434 Broadway • Winter Haven (Florida)



BULK CEMENT—C36; PORTABLE AGGREGATE PLANTS—C36; 100-400 TON PLANTS—J37; DUAL BATCHERS—J40 and J44.

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

Tower Machine Builds A New 3.8-Mile Levee

(*Continued from preceding page*)

50 slope away from the levee. Natural ground is reached from the end of the berm with a 1 on 4 slope.

On the river side there is also a berm at the foot of the slope. This berm is 40 feet wide and has a 1 on 50 slope away from the levee. At its outer edge a 1 on 4 slope goes down to the bottom of a borrow pit, for all material used in the construction of the new levee came from river-side pits. The maximum depth of the borrow pit next to the berm is 27.8 feet below the net grade of the levee. From that point the pit was dug with a 1 on 25 slope out towards the river as far as was necessary to get material. The pits averaged 250 to 350 feet wide. From the back or river side of the pit the return to natural ground has a 1 on 1 slope.

As the new levee is from 700 to 1,200 feet back from the river, ample material was available for the embankment from the river-side pits. Not including the berms on either side, the levee has an average width measured through the base of 150 feet. While the line of the new levee follows that of the old fairly closely, the old levee was entirely degraded. No one knew just what type or types of material went into the construction of the old embankment, so the Corps of Engineers wisely decided to tear it apart rather than build the new structure around it.

Constructing the Levee

As in all levee building, the first step in construction was the digging of an inspection ditch the full length of the project to make certain that there was nothing below the surface of the ground that would result in seepage through the embankment. Old pipe, drainage structures long forgotten, or even buried trees could cause dangerous seepage under or through the levee. This ditch averaged 7 feet in width and 6 feet in depth. After the inspection, the ditch was backfilled with suitable material and compacted. Work on the ditch kept at least 200 feet in advance of the embankment construction.

On the levee itself the land-side berm was built first so that the tower machine would have a stable level base or foundation from which to work. This land-side berm, 50 feet wide, was constructed with tractor-scraper units—4 LeTourneau 12 to 14-yard Carryalls pulled by Caterpillar D8 tractors. Most of the required material came from the upper strata of the borrow pit, or that which was found suitable in the old levee. The haul lengths ranged from 250 to 500 feet.

When enough of the land-side berm was laid out, the tower machine was brought to the project to construct the big earth embankment. The head tower, 140 feet high and weighing 550 tons, worked on the land-side berm, while the 30-foot-high tail tower operated along the far side of the borrow pit. On this job the average distance between the two towers was 650 feet, but this set-up can function well with the towers as much as 1,200 feet apart. Both towers are Bucyrus-Erie machines and move on four sets of crawler treads. The head tower has for a prime mover a Busch-Sulzer 800-hp 5-cylinder 2-cycle air-injection diesel engine, while the tail tower operates from a Wisconsin 100-hp gasoline engine.

Tower Machine

Between the tops of the two towers runs a 1⅝-inch steel cable known as the track line or trolley cable. Over this line rolls a 4-wheel pulley or "bicycle" which is attached to a Sauerman 15-yard bottomless bucket. A 1⅝-inch drag cable runs from the bucket back to a sheave about half-way up the head tower. The machine is operated from a point 80 feet up in the head tower.

With the big bucket on the far side of the borrow pit, the operator tightened the drag cable, thereby pulling the bucket along the ground over the borrow pit in the direction of the head tower. When the levee was reached, the operator tightened up on the track line, thus up-ending the bucket and dumping its load. Further tightening of the track line raised the bucket still higher in the air and caused it to slide by gravity down the cable and away from the head tower. When the far end of the borrow pit was again reached, the operator set the bucket back on the ground by slackening off on the track-line cable. Then the loading, carrying, and dumping cycle was continued.

Only two cables were required on this job, but in some cases where the towers are working at greater distances apart a third cable is required. A ¾-inch backhaul cable is then hooked up between the towers to pull the bucket back to the pit, since the force of gravity alone is insufficient.

Operating Mechanism

The only movement of the tail tower was back and forth along the river-side of the borrow pit in response to signals from the head tower. The tail tower made about 20 moves for every one made by the head tower during the construction of a section of levee 30 to 40 feet long. The embankment was generally brought up in three lifts,

(*Concluded on next page*)

IF YOU NEED 'EM RUGGED—YOU NEED a MILLER—*Tilt-top*

Built for rugged and rough use, Model B is ready for all hauling jobs. This heavy-duty model has proven itself time and again. The all-welded frame is supported by 16" deep axle with Budd hubs and wheels. The superior construction and sound engineering in this model makes it the safest and most dependable trailer on the road.

IMMEDIATE DELIVERY

HYDRAULIC TILT CONTROL
TWO-SPEED WINCH—ELECTRIC BRAKES

RAY MILLER RESEARCH ENGINEERS
DEPT. 349 MILWAUKEE 8, WISCONSIN

The 14-ton key to the city haul!

WHEN THIS SUBWAY excavation began, one problem was to find trucks that could truck the muck 24 hours a day and set a profitable pace over a route, 128 city blocks long!

These International six-wheelers could—and did! They took the muck, 8 yards at a crack, to a dump 8 miles away. Sure, they did it like they were made for the job. They *were!*

This operation required specialized equipment built for the job. The heavy-duty 6 x 4 International KB-11-F was selected. Reinforced side rails withstand unusual shock stresses of big loads dropping into the bed from elevated loading hoppers. The special power divider with integral auxiliary transmission provides a low creeper gear for pulling out of bad spots and an axle ratio coordinated with the main transmission to provide cruising speeds required to meet the schedule. Because of the heavy loads hauled through heavily congested areas, large-size heavy-duty air brakes were installed to insure safe operation.

That's what International means when it says it builds trucks *specialized* for the job. International offers 22 basic models, with gross weight ratings ranging from 4,400 to 90,000 pounds. And it forms 1,000 different truck combinations from 'em—one for every load, road, and haul.

And International's service facilities are just as complete as the line of trucks it offers. 4,700 International Dealers and 170 company-owned Branches are waiting to wait on you . . . any place . . . any time.

So whether you're working on a subway or a skyscraper, a sewer or a sausage factory, International offers a complete line of trucks specialized to the job. A call to your nearest International Dealer or Branch will put you on the right track to the right truck. Why not put in that call right away!

Other International Harvester Products . . . Industrial Power
Farmall Tractors and Machines . . . Refrigeration

Tune in James Melton and "Harvest of Stars"
NBC, Sunday afternoons

INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO

and when one lift was completed over a section that the bucket could reach from a single set-up, both machines moved along to dig from another part of the borrow pit.

For the most part on this job, the borrow pits supplied a sandy loam which was handled very well by tower machines. Of course when the borrow area got soaking wet from heavy rains, the efficiency of excavating by towers was lowered from 50 to 60 per cent by having to dig in water. With the length of movement of the bucket averaging from 400 to 600 feet, the tower machine averaged from 450 to 500 cubic yards an hour; the yardage for a 24-hour working day ranged from 10,000 to 12,000 yards. The head tower was equipped with six 1,000-watt floodlights to illuminate the night operations in the borrow pit and on the embankment.

As each lift of material, about 4 or 5 feet thick, was placed on the embankment, it was compacted by passes of two Caterpillar tractors—a D8 and a D6. This satisfied the requirements of the semi-compacted fill method in which the equipment made four passes at least over the surface. It also resulted in densities in excess of 85 per cent Proctor. When the material had an excessive moisture content it was placed as uncompacted fill and additional material was added for shrinkage.

The head tower was a mighty piece of machinery as it moved ponderously along over the heavy timber mats from which it worked. Its 800-hp diesel engine drove a General Electric 500-kw 2,300-volt ac generator. An alternating instead of a direct-current generator was used because of its smaller size; a dc unit would occupy too much room in the limited quarters in the cab of the tower machine. From the generator, the power passed through a switchboard to a G-E 600-hp ac synchronous motor which in turn pulled two G-E dc generator sets—a 325-kw and a 150-kw unit. The larger generator drove two G-E 187½-hp dc motors which operated the dragline drum and crawler treads on the tower. The smaller generator drove a similar G-E 187½-hp dc motor which operated the track-line drum. Direct-current motors were preferred since they could handle a full load at slow speeds, and would pull to a stall without danger of overheating.

Crew and Maintenance

A crew of 35 was employed on the project, with the tractor-scraper units working one shift and the tower machine using three shifts for 'round-the-clock operations. The tower machine moved its large yardage with a minimum of workmen. Only five men a shift were required for both towers. Each tower had one operator, while the three remaining men were at the head tower—one as deck engineer and two as oilers.

The Standard Oil Co. of Indiana delivered fuel to the project from Wood River, Ill., in transport trucks. It was stored in a 10,000-gallon tank, and from there a service tank truck hauled the fuel out to the machines. The head tower carried a 3,000-gallon tank for diesel fuel, together with an overflow tank of 500 gallons, and a day tank of 90 gallons which was kept filled by pumping from the main tank. The machine used about 40 gallons of diesel oil per hour. The engine was water-cooled by ninety sections of 6 x 40-inch radiators; other radiators of similar size were used to cool the oil. A G-E 300-amp welder was part of the maintenance equipment.

Before coming to this levee project, the tower machine worked on another big earth-moving contract in the St. Louis Missouri Engineer District near Wolf Lake, Ill., farther down the river. On a 10-mile levee job, the tower machine, with the help of some hauling equipment, placed 3,400,000 yards of material in 308 working days.

Quantities and Personnel

At this Harrisonville and Ivy Landing Drainage and Levee District contract, the only other item besides the 1,970,000 cubic yards of embankment levee was one for 136 acres of seeding and mulching. The entire surface of the levee, including all berms, will be seeded with the following seed mixture per acre:

Alta fescue	25 lbs.
Perennial ryegrass	4 lbs.
Timothy	6 lbs.
Redtop	2 lbs.

For Luhr Brothers, Contractors, W. H. Carder was Superintendent on the construction of the levee, while the Corps of Engineers was represented on the project by Herman H. Clark, Superintendent of Construction. Earl W. Hammack is Head of the Levee Construction Branch, assisted by Lynn Dillow.

The project was under the direction of Colonel R. E. Smyser, Jr., District Engineer, St. Louis Missouri Engineer District. E. H. Shutt is Technical Information Officer. The Division Engineer, Colonel Clark Kittrell of the Upper Mississippi Valley Division, exercised general supervision over the work.

Where-to-Buy Lumber Guide

Lumber-supply sources are listed in a catalog compiled by the West Coast Lumbermen's Association, 1410 S.W. Morrison St., Portland 5, Oreg. This directory tells where to buy Douglas fir, west-coast hemlock, Sitka spruce, and western red cedar. It indicates the production capacity and facilities of the various members of the association, as well as the types of their products.

The catalog lists each producer's name and address, name and address of key personnel, equipment used, capacity of the plant, types of lumber handled, and types of lumber products turned out at each plant.

Copies of this literature may be obtained from the association. Or use the enclosed Request Card. Circle No. 80.

DAREX AEA

For high quality air-entrained concrete —backed by a competent engineering field service readily available from your distributor.

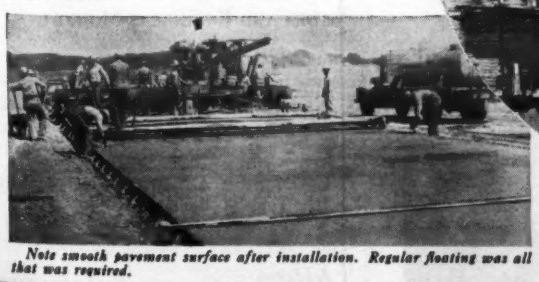
DEWEY AND ALMY CHEMICAL COMPANY
CAMBRIDGE 40, MASS.

Mechanical Dowel AND TIE-BAR INSTALLER

AIRPORT CONTRACTORS—SAVE TIME AND MONEY

You eliminate stakes, complicated holding harness and expensive hand labor, and are assured of perfect alignment with this Flex-Plane installer. Job tested for three years, this machine has demonstrated substantial savings in time and money. Let us tell you how—write today to Flex-Plane, Warren, Ohio, for Bulletin J-105.

- ADJUSTABLE TO VARIOUS DOWEL SPACINGS
- ADJUSTABLE TO VARIOUS PAVEMENT WIDTHS
- INSTALLS IN EXACT POSITION AND ALIGNMENT
- CUTS JOINTS



Note smooth pavement surface after installation. Regular floating was all that was required.

A. Bar gripped by mechanical fingers ready for vibrated insertion into plastic concrete. Tie-bars and dowels easily insert into fingers.
B. Bar has been worked, by vibration, to pre-determined depth. Rear holding finger was disengaged as bar started through concrete.
C. Completed operation. Vibrated removal of fingers assures complete seal of plastic concrete. Surface disturbance is minor.

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WARREN OHIO
(FLEXIBLE ROAD JOINT MACHINE COMPANY)

Operation of production machinery in the presence of moisture, steam and acids has always been a serious problem in many processing industries. There are a number of LUBRIPLATE lubricants that satisfactorily meet these unfavorable operating conditions, thereby protecting machine parts against rust and corrosion. Write for interesting particulars.

LUBRIPLATE

Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

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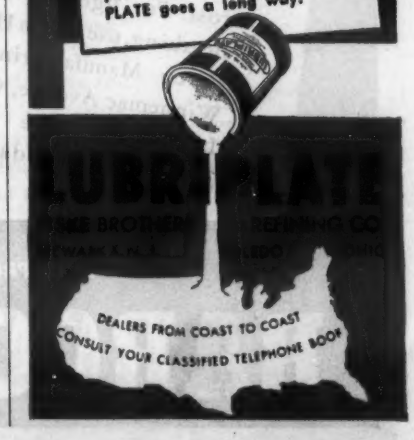
Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.



Motorists Control Expressway Signals

When the majority of motorists approach the city of Santa Barbara, Calif., over a new multimillion-dollar highway, they are aware only of a fast silk-smooth stretch of pavement. Few among them realize that motorists on the cross streets regulate the flow of traffic on Highway 101.

Automatic control of traffic lights has been made possible by the use of a system of treadles. It is not entirely new in southern California, having been in use in some sections for the last 2 years. But the Santa Barbara highway, carrying a large proportion of San Francisco-Los Angeles traffic, is expected to test the equipment's ability to meet modern traffic requirements on a major highway. The test is being closely watched by officials of the California Division of Highways.

The signals at five cross streets are operated automatically by steel treadles set flush in the concrete pavement, and so placed that a car on the cross street cannot avoid registering its passage. As a car crosses one of the treadles, a message goes to the electric brain of the signal. The message is: "I'm next." And in a moment, a red light halts the flow of traffic on the highway, while a green light gives the go-ahead signal to cross-street traffic.

As long as there is no cross traffic, the cars on the highway flow along uninterrupted, for the green light shines until a car trips a treadle on one of the cross streets.

The new highway has just been finished. It has two lanes in each direction, divided by a 24-foot-wide parkway, and it includes a large overhead bridge which spans two streets and a railroad spur. This bridge cost most of the amount expended for the highway, exclusive of sums paid for right-of-way.

The treadle-type controls are called Electro-Matic signals, and are made by the Automatic Signal Division of Eastern Industries, Inc., of East Norwalk, Conn.

CSC Still Needs Engineers

Several engineering positions are still open with the United States Civil Service Commission. The CSC has been accepting applications for these positions for several months, but it has not as yet filled all the existing vacancies. It would like to bring this fact to the attention of all qualified persons who have not as yet applied.

Positions are open in branches of engineering and in all CSC classifications. Starting salaries range from $2,974 to $5,905. The jobs are located in various Federal agencies in Washington, D. C., and vicinity. No written test is required. The maximum age limit in the lowest classification is 35; for other jobs, 62. These age limits are waived for persons entitled to veteran preference.

Applications and further information can be obtained from the U. S. Civil Service Commission, Washington 25, D. C.; from any U. S. Civil Service Regional Office; and from any first or second-class post office.

For heavy concrete breaking, BARCO MODEL H-6B

No Job too Big or Small for BARCO

FOR heavy concrete breaking and back-fill tamping, the Barco Hammer (H-6B) is unbeatable. Its portability means easier handling, plus the ability to get jobs done in difficult or hard-to-reach spots. Barco is packed full of power, deals a smashing battering attack that never slackens no matter how tough the going. And as for profit, Barco's mechanized muscles do more work at lower cost. For lighter work, especially frost breaking, use Barco Hammer (J-2). Write Barco Manufacturing Company, 1818 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

For breaking medium and light concrete, and hard or frozen ground, BARCO MODEL J-2

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

BARCO PORTABLE HAMMERS • BREAKING · DRILLING DRIVING · TAMPING

CARTER CARTER CARTER

The shape of the McCulloch bow saw permits it to cut timber in any position—even flat on the ground—without pinching, prying, and wedging.

Design of Bow Saw Permits Unusual Cut

A 20-inch bow saw is available from the McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif. Its shape permits it to cut timber in any position—even lying flat on the ground—without pinching, prying, or wedging, says the manufacturer.

Power for the saw is supplied by the same 5-hp McCulloch unit used with the company's other chain saws; thus it can be interchanged with any length of straight blade and chain up to 5 feet. The McCulloch chain and bow saws feature full 360-degree swiveling, automatic clutch, automatic control of chain tension, kick-proof starter, special fast-starting magneto, operation of the engine in any position, and a Rip-Cross chain which does not need setting. Total weight of the bow-saw model is 63 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 5.

Fluid-Coupling Unit Absorbs Shock Loads

Fluid coupling is now available for installation on certain Chrysler engines, according to a report released by the Industrial Engines Division of the Chrysler Corp., 12200 E. Jefferson Ave., Detroit, Mich. The coupling, complete with clutch, clutch housing, and either a 3 or a 4-speed transmission, is now offered for use on the Models 5, 6, 7, 8, and 12 engines.

The Gyrol fluid coupling is designed to prevent shock to the equipment by providing a safety cushion between the source of power and the load and to prevent stalling. According to the manufacturer, damage formerly encountered when a ditching machine, for example, hit a large water pipe, or a shovel struck a heavy rock, is eliminated. The coupling is also said to provide longer clutch life and to ease the process of jockeying equipment into position.

The coupling permits the engine to be accelerated close to the torque peak with the output shaft turning at a lower speed. Declutching when operating the engine without load is unnecessary, because as the engine idles, the coupling slips to permit free turning of the engine. When the coupling is used on road rollers, the roller can coast against the coupling on its own momentum.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 37.

Represents Haiss in Mass.

Dan G. Caywood, Jr., 272 Highland Ave., Newton, Mass., has been appointed an exclusive representative of the George Haiss Mfg. Co., a division of Pettibone Mulliken Corp. Caywood will cover part of Massachusetts and all of Maine and New Hampshire. Haiss manufactures a line of conveyors, loaders, buckets, material-handling equipment, crushers, asphalt plants, etc.

Belt-Drive Design Manual

A 100-page manual for use in designing multiple and light-duty V-belt drives has been put out by the United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. In addition to the general technical information it presents, it discusses in detail the various U. S. Rubber belts. These include the U. S. Royal super-service V-belts, U. S. Rainbow steel cord belts, and standard U. S. Rainbow V-belts with Equa-Tensil cord section.

The manual is divided into ten sections: typical installations and V-belt design; multiple V-belts for replacement; design data for multiple V-belt drives; sheave specifications; special multiple V-belt drives; V-to-flat drives; fractional-horsepower V-belt standard drives; fractional-horsepower V-belts for replacement; quarter-turn drives and double V-belts; and open-end V-belting.

Engineering information presented in the manual includes the mathematical formulae involved and tables listing complete specifications and design characteristics of every belt in the U. S. Rubber line. The data cover both standard and special drive applications.

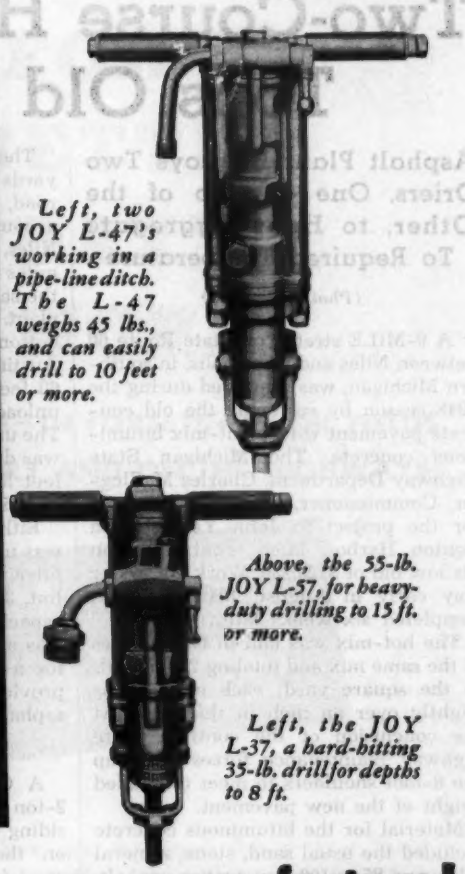
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 16.

FLINK SPREADER

Unquestionably the finest hydraulic spreader.

Hundreds more transportation companies, cities and counties are using Flink Spreaders to spread granulars in ice control and highway maintenance work. Spreads forward or backing up, full or half width of street. Controlled from cab. Write for literature.

FLINK CO. Dept. S-5 **Streator, Ill.**

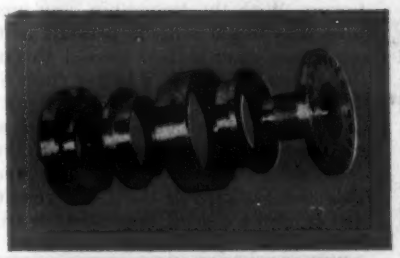


Left, two JOY L-47's working in a pipe-line ditch. The L-47 weighs 45 lbs., and can easily drill to 10 feet or more.

Above, the 55-lb. JOY L-57, for heavy-duty drilling to 15 ft. or more.

Left, the JOY L-37, a hard-hitting 35-lb. drill for depths to 8 ft.

Faster, harder *PUNCH* gives you more footage!



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SAVE TIME with JOY THRO-WAY BITS

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The *exclusive* features of JOY "Silver Streak" Drills—cadmium plating and the famous "Dual Valve"—mean just this to you: faster drilling and less cost per foot of hole—smoother operation, easier on the drill-runner—longer service life and less maintenance. ● Prove these advantages for yourself—write for bulletins, and let us arrange a demonstration for you *on the job!*

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GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

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C. & E. M. Photo

Stone for John Yerington's plant-mix surfacing job in Michigan was unloaded from bottom-dump cars at the Cedarapids asphalt plant by this Austin-Western conveyor.

Two-Course Hot-Mix Tops Old Pavement

Asphalt Plant Employs Two Driers, One on Top of the Other, to Heat Aggregate To Required Temperature

(Photo on page 1)

✦ A 9-MILE stretch on State Route 60 between Niles and Cassopolis, in southern Michigan, was improved during the 1948 season by surfacing the old concrete pavement with plant-mix bituminous concrete. The Michigan State Highway Department, Charles M. Ziegler, Commissioner, awarded a contract for the project to John Yerington, a Benton Harbor, Mich., contractor, on his low bid of $123,230. Work got under way early in August, 1948, and was completed six weeks later.

The hot-mix was laid in two courses of the same mix and totaling 220 pounds to the square yard; each course was slightly over an inch in thickness. At the conclusion of the contract, state highway maintenance forces built up the 8-foot shoulders to meet the added height of the new pavement.

Material for the bituminous concrete included the usual sand, stone, mineral filler, and 85 to 100-penetration asphalt. The sand was obtained locally from a pit only 4 miles from the batch plant, and was excavated by a Michigan dragline equipped with a 30-foot boom and a Page ½-yard bucket. Three Sterling 10-yard trucks hauled the sand from pit to plant. The other ingredients all came by rail: the stone from the Lincoln Crushed Stone Co. at Joliet, Ill.; the lime-dust mineral filler in 80-pound bags from the National Mortar & Supply Co. at Gibsonburg, Ohio; and the asphalt from the Lion Oil Co. at El Dorado. Ark.

The asphalt plant was set up within yards of the New York Central Railroad, on one of the sidings. It was off a county road about 2 miles north of Niles, and was an average haul of 8 miles from the job. The trucks hauling the sand stockpiled it at one side of the plant. The stone was unloaded from bottom-dump cars into stockpiles by an Austin-Western conveyor which was 60 feet long and had a 20-inch belt. It unloaded at the rate of 80 tons an hour. The unloading pit under the siding track was dug 4 feet wide x 6 feet deep and 5 feet long. The cars were shifted about over it by a Caterpillar D8 tractor.

Either hand labor or the conveyor was used to unload the bags of mineral filler, which was stored in a Quonset hut, 36 feet long x 24 feet wide, with a capacity of 4½ carloads. Part of this hut was also used for a tool storeroom and for a bunkhouse where quarters were provided for four members of the asphalt-plant crew.

Asphalt-Plant Driers

A Cedarapids asphalt plant with a 2-ton pugmill was set up adjacent to the siding on the west and the county road on the east. The 30-ton aggregate-receiving hopper was placed at the north end of the plant, with the stockpiles of sand and stone on either side. The hopper bin was divided into three compartments—the two outside compartments for stone and the middle one for sand. They were filled from the aggregate piles by a Northwest Model 25 crane equipped with a 45-foot boom and a Blaw-Knox ¾-yard clamshell bucket. Underneath the hopper bin was an electrically controlled adjustable feeder which moved the aggregate along to a Barber-Greene conveyor with a 56-foot length and a 24-inch belt.

C. & E. M. Photo

While the 60-foot conveyor built up stockpiles of stone, this Northwest Model 25 crane with a 45-foot boom, clammed sand obtained from a local pit into the 30-ton aggregate-receiving hopper at the plant.

C. & E. M. Photo

To drive all moisture out of the aggregate before it was mixed with asphalt, these two Hetherington & Berner driers were used at the plant, one on top of the other.

At the top of the conveyor belt the aggregate was discharged into a drier—the top one of two driers with which the plant was equipped. Originally the plant had only the lower drier as standard equipment. However, the Michigan State Highway Department recently revised its specifications, requiring larger storage bins at the top of asphalt-plant towers. With the larger bin, any moisture that might still be present in the aggregate after it had passed through the drier would have a better chance to dry out. It would have been difficult to add larger storage capacity for the aggregate at this plant, so the contractor decided to install another drier instead. This would achieve the same result—that is, drive out all the moisture from the aggregate before it was mixed with the asphalt.

As the plant area was too limited for the addition of new equipment, it was decided to install the second drier directly above the first. A framework of steel channels and I-beams was erected to support the added drier. The uprights were cut at different lengths so that the upper drier pitched to the west, while the bottom drier pitched to the east. Both driers were Hetherington & Berner. At the low end of the top drier, opposite the place where the aggregate entered, was a single Hauck burner. The material passed through this drier from east to west, then dropped into the bottom drier and reversed its travel, going

(Continued on next page)

C. & E. M. Photo

Prior to placing the first course of plant-mix, the old concrete pavement was given a bond coat of AE-2 emulsified asphalt by a South Bend distributor on a GMC truck.

C. & E. M. Photo

Then a Barber-Greene Finisher—shown here receiving an 8-ton load of plant-mix—laid the first of two courses in a 10-foot lane, followed by an Austin-Western 10-ton roller.

from west to east. At the lower, or east, end of the bottom drier were two Hauck burners, but it was necessary to use only one of them.

In the operation of the plant, the upper drier heated the aggregate to 180 degrees F, while the bottom drier supplied the rest of the heat necessary to bring the material up to the desired 335 degrees F. Most of the moisture was removed in the upper drier, and the heat was carefully controlled within the lower drum. When the plant was equipped with only the lower drier, it had a capacity of 45 tons per hour. By the addition of the second drier the output was increased to 70 tons an hour. The top drier was 16 feet long x 5 feet in diameter, while the bottom drier was 24 feet long and also 5 feet in diameter. They were both synchronized to turn at 10 rpm.

Plant Operations

The outlet pipe for fines and dust was located at the upper end of the top drier. This light material was pulled into a dust collector by a Sturtevant 60 Planovane Exhauster which functioned through a 24-inch-diameter pipe 40 feet long. Placing the fan at a distance eliminated considerable wear on moving parts, since the fines were not pulled through it. Each drier had a stack to carry off the smoke and fumes. The heated aggregate dropped from the bottom drier onto an enclosed 35-foot-high hot elevator, where it was joined by the fines from the dust collector which were chuted down to the foot of the elevator.

At the top of the elevator the aggregate was spilled out over a double-deck screen. The upper deck was divided into ½-inch and ⅝-inch openings, while the lower deck had No. 6 openings for the sand. Oversize material slid through an overflow pipe to the ground, where it piled up. When the pile became high enough, the crane loaded the aggregate into a truck which hauled it away. From the screens, the sand and stone dropped into three bins with a total capacity of 16 tons, two bins for the stone and one for the sand.

On the other side of the plant tower, opposite the hot elevator, was another enclosed elevator which carried the mineral filler from the storage Quonset hut up to the level of the bins. The bags were opened by hand and dumped into a hopper which fed the material to the elevator. At the top was a bin accommodating 1,200 pounds of the filler. A worm auger pushed the dust to the weigh bucket, as the batches were weighed out on Kron dial scales before being dumped into the 2-ton pugmill.

Asphalt Handling

Just west of the mixing tower were two horizontal asphalt-storage tanks with a total capacity of 30,000 gallons. The railroad tank cars were heated, and the asphalt was unloaded into the storage tanks by the two South Bend distributors on the job—a 1,250-gallon unit on a Dodge and a 1,080-gallon tank on a GMC. A 3-inch asphalt pump circulated the bitumen from the tanks to the pugmill through a 3-inch feed line with a 2-inch return. The steam-jacketed line had a 3-way valve so that the asphalt could be pumped from either tank and returned to either. The asphalt bucket above the pugmill held 30 gallons or 250 pounds.

Steam to heat the tanks, jacketed lines, etc. was furnished by a Bros 150-hp horizontal boiler equipped with a single Johnson burner. An electric eye on the fuel line stopped the flow of fuel as soon as the fire went out. This big boiler served the plant during the day, but at night, when it was necessary to heat only the bitumen, a smaller boiler was put in service. The latter was a Port Huron 30-hp horizontal boiler. Water for the boilers was pumped from a near-by creek by a 4-inch piston pump through 700 feet of 2½-inch pipe line to a 3,000-gallon water tank.

Light and heavy fuel oil for the plant operation was supplied by the Standard Oil Co. of Indiana. The lighter No. 3 oil was delivered to the job by truck from local service stations in Niles, Mich., and stored in a 2,000-gallon tank. The heavier No. 4 fuel oil, which the burners consumed, came in tank cars from Whiting, Ind., and was stored in a 10,000-gallon tank.

(*Concluded on next page*)

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Two-Course Hot-Mix Tops Old Pavement

(Continued from preceding page)

Diesel-Electric Powered

Power for the various operations of the plant was furnished by two Caterpillar D13000 diesel engines, each equipped with 75-kw generator sets. They supplied power to run the fourteen assorted G-E motors, ranging from 2½ hp up to 60 hp, which functioned as follows:

Function	Horsepower
Pugmill	60
Dust elevator	7½
Dust screw auger	3
Hot elevator	10
Screens	10
Asphalt pump	10
Fan	25
Lower drier	25
Upper drier	20
Boiler—fan and fuel pump	25
Aggregate feeder	2½
Conveyor from feeder	7½
Conveyor for unloading at track	10
Fuel pump for burners	3

A Kohler 3½-kw generator set was also on the plant site for electric light.

The Mix

The weights and percentages of a typical job-mix batch coming from the 2-ton pugmill were as follows:

Bitumen	220 lbs.	5.5 per cent
Mineral filler	180 lbs.	4.5 per cent
Sand	1,288 lbs.	32.2 per cent
Stone	2,312 lbs.	57.8 per cent
Total	4,000 lbs.	100.0 per cent

The gradation of the sand, stone, and mineral filler was as follows:

Sieve Size	Per Cent Passing		
	Stone	Sand	Mineral Filler
⅝-inch	100	....	....
½-inch	90-100	....	....
No. 4	0-25	....	....
No. 10	0-10	0-5	....
No. 40	....	5-35	100
No. 80	....	30-60	....
No. 200	....	15-35	75-100
Passing No. 200	....	0-5	....

A crew of 13 was used at the plant: a plant superintendent; plant operator or mixer man; crane operator; 2 men on unloading cars of stone; 2 men at the receiving hopper, one on top and one on bottom; 2 men to handle the limestone filler dust; 2 boiler men, one day and one night; and 2 men on the burners.

Putting Down the Black-Top

Prior to the first course of plant-mix, the old concrete pavement was given a bond coat of AE-2 emulsified asphalt at the rate of 0.15 gallon to the square yard. This was shot 1,000 feet at a time over half the width of the road by a South Bend distributor on a GMC truck. The AE-2 emulsion was stored at the asphalt plant in a 10,000-gallon tank, and was put on at a temperature of around 115 degrees F. As the laying of the plant-mix caught up with the bond coat, more was applied. It was not run out too far in advance because traffic was being maintained on the highway.

From 8 to 12 trucks, averaging 8 tons a load, hauled the hot-mix from the plant to the road, an 8-mile average haul. They drove under the tower for their loads, then backed out; on leaving the plant, they were weighed on a Winslow beam scale, for the trucks were hired on a ton-mile basis. The mix was dumped into the trucks at temperatures between 320 and 345 degrees F, and was covered with tarpaulins so that little heat loss was experienced.

The mix was laid by a Barber-Greene Finisher in 10-foot lanes, half the width of the road at a time for one day's work. On the following day the finisher dropped back and did the other half so as always to advance the full pavement width, first with the bottom and then with the top course. Rolling was done by an Austin-Western 10-ton tandem roller with a Buffalo-Springfield 10-ton tandem roller in reserve. When traffic became too heavy, and there was danger that it might break down the unprotected edge at the center of the single lane, the full width was advanced in one day's work. Thus the finisher laid half the road in the morning and the other half in the afternoon. From 1 to 2 miles of single lane was done on the average during a 10-hour day.

Water for the paving equipment was hauled from Niles in a 2,000-gallon trailer tank, and pumped out with a 2-inch pump. Fuel oil was carried along to clean the tools and the finisher. A 13-man crew was also required for the resurfacing operations on the road. Included in the group were a foreman, a finisher operator, screed man, roller operator, 2 rakers, 2 laborers, 3 watchmen for maintenance of traffic, and 2 men on the bituminous distributor.

Quantities and Personnel

Only four items were included in this 9-mile contract:

Bituminous bond coat of AE-2 emulsified asphalt	15,845 gals.
Bituminous concrete	11,665 tons
Chipping pavement for joints	52 ft.
Maintaining traffic	9 miles

Contractor John Yerington had Walt Smith for General Superintendent, while Fay Jennings was Plant Superintendent and Stanley Brown was Foreman at the finisher.

The Michigan State Highway Department, which is headed by Charles M. Ziegler, Commissioner, was represented by Frank Skebensky, Project Engineer, with Max Kaiser, Plant Inspector, and Harold Gardner, Street Inspector. H. C. Coons is Deputy Commissioner and Chief Engineer of the Department, and Scott A. Baker is Acting Engineer of Construction.

Batch Plants in 3 Styles

Central-mix, transit-mix, and concrete-products batching plants are described in a catalog prepared by The Heltzel Steel Form & Iron Co., Warren, Ohio. Bulletin J-37 tells how to select a plant of proper size and capacity for a specific job, and how the Heltzel plants can be adapted for use in all locations under varying conditions.

The catalog pictures plants of all sizes in use on a wide variety of jobs. It contains information on standard bin dimensions, batcher capacities, compartment capacities and arrangements, schedule of wedge bins, dimensions for bulk-cement tanks for recirculating systems, foundation plans, bucket elevators, bin gates, elevator feeders, aggregate hoppers, water-handling equipment, combination and truck-mixer batchers, etc. It also describes aggregate and cement handling.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 39.

- *Hydraulic Controls*—for easy handling.
- *Continuous Coarse Correction*—corrects irregularities with successive courses.
- *Powerful Six Cylinder Engine*—power to handle the heaviest truck.
- *Four Wheel Drive*—for better traction.
- *Cutter Bar*—overlaps and compacts joint—"crowds" and compacts materials.
- *Power Cut-Off*—permits carrying load over intersections and eliminates tag-end runouts.
- *End Gates*—permit feeding material out to sides with cutter bar extension.
- *Screed Heater*—assures better handling of material.
- *Crowning Adjustment*—for any crown or bank.
- *Either Rear Roller*—can be disengaged for quick turning.
- *Hopper*—big, adjustable for narrow pavements.
- *Sturdy, Heavy Construction*—that stands the strain of work without constant rebuilding.
- *Adnun Carryall*—easily attached, makes moving up on jobs easy.

LOOK at this job! Here was a case where, to maintain the crown of the pavement, a blended or feathered edge was required on the left-hand course.

Simple adjustments take care of these things in the Adnun Black Top Paver. Pavement edges can be feathered to handle widening or they can be sharp and firm. The Cutter Bar can be tilted to ride on the heel—a distinct advantage with some materials.

Bevel, renewable teeth provide an initial compression and the overlapping action of the cutter bar carries material up to the parallel course and compresses it for a tight joint.

End gates can be raised for bleeding or for feeding material to cutter bar extension and the power cut-off permits shutting off the flow of material to the subgrade, eliminating tag-end runouts and making it possible to carry material over intersections.

In addition to this the Adnun lays sand, stone and cinder as well as Asphalt. There never was such flexibility offered in a Black Top Paver.

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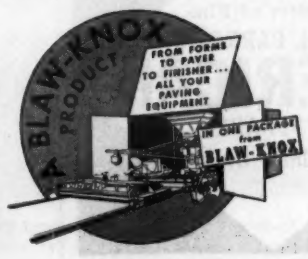

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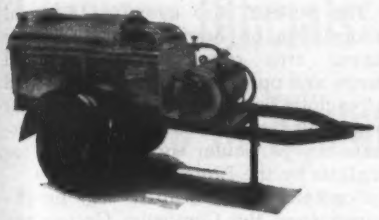

This Flash-Guard Heet-Master kettle for melting bituminous material is designed to be flame-proof.

Flame-Proof Design Is Feature of Kettle

A bituminous melting kettle designed to eliminate the danger of fires started by the material reaching or surpassing its flash-point temperature is announced by Aeroil Products Co., Inc., Wesley St., South Hackensack, N. J. During tests conducted on the kettle, Aeroil reports, raw gasoline and kerosene were poured into it while it was in operation, without any fires occurring.

The Flash-Guard Heet-Master kettle is designed so that the hot flue gases are returned into the kettle instead of being dissipated into the air. These gases, composed mostly of carbon dioxide, are held under the cover and vented to the rear. Thus the entire area under the cover and over the bituminous material is blanketed by a steady flow of the non-inflammable flue gases. These gases fill the entire area, the manufacturer points out, and eliminate the presence of any oxygen. Without oxygen, of course, no fires can exist. The protective layer of flue gases is said to be present as long as the burner is in operation.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 71.

Compressors in Six Sizes

Air compressors in six sizes are the subject of a catalog issued by The Jaeger Machine Co., 701 Dublin Ave., Columbus 16, Ohio. The Air Plus compressors are made in sizes of 75, 125, 185, 250, 365, and 600 cfm. They are designed to provide from 90 to 100 pounds of pressure.

Catalog JC-8 features the compressor valves, divided cylinder heads, 2-stage compression, balanced W-design, air-cooling system, automatic drainage, 3-point mounting, drop-forged crankshaft, pistons, connecting rods, cylinders, oil filter, and oil pan.

It also contains a large picture of each compressor model and a chart showing the type and number of tools it can be used to drive. There is a short description of each model, as well as a chart of its dimensions and weights. Where pertinent, the catalog also lists the size and type of engine available with each compressor.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 32.

Executive of PCA Dies

Arthur J. Boase died recently of a heart attack. At the time of his death, Mr. Boase was Manager of the Structural and Railways Bureau of the Portland Cement Association. He had been with the Association since 1930.

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Aggregate-Wash Plant Features Versatility

A new washing plant for sand, gravel and crushed aggregates is announced by the Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn. The 305-W plant is said to scrub, clean, and wash from 50 to 75 yards of aggregate per hour. According to the manufacturer, the unit is easy to set up, take down, and move from one location to another.

A reciprocating feeder at the end of a 70-foot conveyor loads the plant. The revolving scrubber drum and revolving screen are designed to separate three sizes of stone and sand. This material is deposited in bins under the plant, ready for direct truck loading. A drag-type dehydrator delivers sand to one compartment of the bins. When desired, a second dehydrator can be used to provide an additional grade of sand. The manufacturer states that the 305-W will use from 300 to 500 gallons of water per minute. The 305-W is one-man-operated and requires a power source of 35 hp.

The Pioneer 305-W washing plant will handle 50 to 75 yards of aggregate per hour. It can separate three sizes of stone and sand.

Further information on these plants may be secured from the company, or by using the enclosed Request Card. Circle No. 76.

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For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.
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Pull-Type Sweepers Feature Full Swing

Pull-type rotary power sweepers with a patented full-circle swing are made by Henke Mfg. Corp., 100 Main St., Janesville, Iowa. They are available in two sizes: a 7-foot model and a 10-foot model consisting of two 5-foot oscillating cores. Henke recommends them for sweeping bituminous roads before re-treatment, removing excess screenings from base courses prior to surfacing, and for street-sweeping and snow-removal operations.

Power for the sweepers is obtained from a 22-hp Wisconsin gasoline engine. The brush is independently driven by the engine through a multiple V-belt drive and can be revolved at any suitable speed. It is suspended from equalizing springs on a sub-frame designed to permit it to operate at any angle—either right or left—and to be carried under the frame for transporting and storage. Pressure on the brush is controlled by means of a lever.

The sweeper is mounted on 6:00 x 16 pneumatic tires with steel wheels. Other tire sizes can be furnished as optional equipment. A stub pole is standard equipment. The 7-foot sweeper has an overall length of 18 feet 2 inches, width of 7 feet 7½ inches, and overall height of 6 feet 10 inches. Height to the operator's platform is 3 feet 5 inches. The rear tread is 60 inches, front tread 42 inches, and turning radius 132 inches. The Model 7 sweeper has an approximate weight of 2,470 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 99.

Officers for Pump Bureau

W. J. Fleming has been elected Chairman of the Contractors' Pump Bureau, an affiliate of The Associated General Contractors of America, Inc. Mr. Fleming is Field Sales Manager for the Worthington Pump & Machinery Corp.

Other Bureau officers include A. S. Marlow, Jr., of Marlow Pumps, Vice Chairman; B. F. Devine of Chain Belt Co., and F. B. Hout of Barnes Mfg. Co., Members of the Board of Governors; and L. S. Holden of Construction Machinery Co., whose term as a Member of the Board carries over. Kenneth H. Cadigan of the Gorman-Rupp Co. has been named by Chairman Fleming to direct the Bureau's publicity and information program.

W. J. Fleming of Worthington Pump & Machinery Corp. was recently elected Chairman of the Contractors' Pump Bureau, an affiliate of the AGC.

Vibrating Screen Has Hub-Mounted Bearings

Vibrating screens are the subject of a 16-page catalog issued by the Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis. Among the features claimed for the Screen-All line, and described in detail in Bulletin 1200, are sharp sizing action, high capacity, low first cost, long life, low headroom, light substructure, easy installation, reduced maintenance costs, and high flexibility.

The bulletin lists the specifications and dimensions for 69 sizes of single, double, and triple-deck screens. It also describes in detail the chief features of the Screen-All positive eccentric vibrating screens. These include hub-mounted bearings located outside the screen body, straight-shaft design with eccentricity achieved by means of patented hubs, three-point suspension or support, and a patented vibration equalizer.

The bulletin also contains technical information on how to determine the screen area required, recommended throw and operating screen speeds, and wire-cloth sizes and weights. An insert is provided on which to list and illustrate any particular screening need for analysis by the Lippmann engineers.

Copies of this literature may be obtained from the Company. Or use the enclosed Request Card. Circle No. 66.

you'll move more loads with "surface peened" RAZOR-BACKS

strongest light shovels made, because they have a full-length backbone: The center section, where shovels get all their wear and strain, is 13 gauge thickness all the way from cutting edge to upper part of socket. The sides, where shovels never wear out, taper to 17 gauge. No other shovel has this correct construction.

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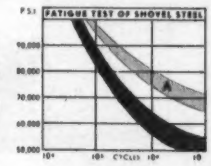

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The McCarthy Vertical Drill, manufactured by The Salem Tool Co., is adaptable to high wall and key way drilling and diamond drill boring . . . drills 90% of all limestone and sand rock formations, and readily burrows through shale. Send today for complete information, and for a free copy of The Salem Tool Company booklet.

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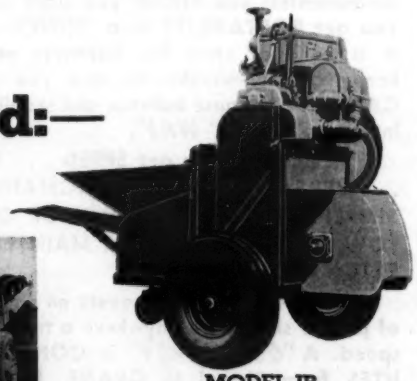

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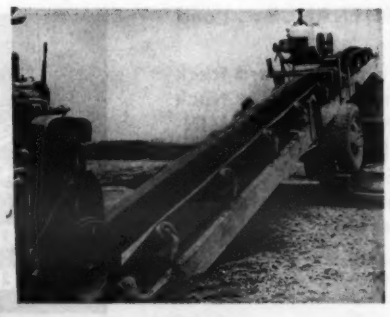

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Highway Officials Convene in Boston

North Atlantic States Group Discusses Number Of Highway Problems At 25th Convention

+ APPROXIMATELY 1,200 delegates and visitors attended the 25th annual convention of the Association of Highway Officials of the North Atlantic States held in Boston March 1-3. Administrative, design, construction, and maintenance problems were discussed by the speakers in the five sessions. In addition, 24 manufacturers and dealers were represented in the exhibit of highway equipment and materials held in conjunction with the convention.

President Reviews Year

In the customary Presidential address, William F. Childs, Jr., Chief Engineer, Maryland State Roads Commission, reviewed briefly what the twelve member states have accomplished during the past year and what future needs and problems will be.

In the North Atlantic states during the past year, there were 2,335 highway construction projects on 3,366 miles of road, with contracts amounting to $367,182,000. However, these states are trailing others and the nation as a whole in their use of the Federal-Aid funds available, and Mr. Childs urged further participation in view of urgent road needs. "We must have a definite highway program scheduled for the next 15 to 20 years," Mr. Childs said. Such a program would:

1. Instill confidence in contractors and encourage them to build up their organizations for even greater efficiency, with resulting economy in highway work;
2. Enable materials and aggregate producers to plan far enough in advance to insure adequate supplies and prompt deliveries;
3. Provide the incentive for equipment manufacturers to continue the improvement and output of their products;
4. Encourage highway departments to build up their personnel;
5. Make it possible to prepare surveys and plans well in advance of construction, and to acquire sufficient right-of-way to allow specific projects to fit into the overall highway plan;
6. Provide full information on job conditions to contractors and avoid costly delays, thus helping to increase efficiency and keep down costs;
7. Result in a systematic and progressive improvement of the highway system, with a minimum loss of initial investment.

One of the many problems of highway officials today is that of right-of-way, Mr. Childs pointed out. Certainly it is the greatest obstacle to building safety into our highways. At present, most highway departments lack sufficient authority to acquire and to control the use of right-of-way. The only solution is to obtain the necessary authority and secure right-of-way years in advance of construction.

Another pressing problem is the urban one. It has been neglected so long and the costs for adequate urban highways are so high that there is a tendency, Mr. Childs said, to adopt short cuts and half-way measures. However, further delay only increases the ultimate cost and injures local business.

[As subjects particularly requiring further attention and study, Mr. Childs recommended the following: Relative merits of various types of state highway administrations; financing rural roads; highway needs; interstate highway contracts; Federal participation in right-of-way costs; utilities along the highways; roadside control; traffic control—signs, etc.; and prompt payment to contractors.]

In his conclusion, Mr. Childs pointed out that highway construction and maintenance affect more people than any other single activity, and yet highway officials have overlooked the important matter of public relations. He urged more organized publicity and improved public relations in order to bring highway needs and problems to the attention of everyone.

Other speakers at the opening session included the Hon. Paul A. Dever, Governor of Massachusetts, and the Hon. William M. Cottingham, representing the Hon. Antonio Talbot, K. C., Minister of Roads for the Province of Quebec and President of the Canadian Good Roads Association. Governor Dever expressed his hope that Massachusetts will regain its former position in the possession of good highways, and urged more efficiency and simplicity in the administration of highway affairs. Mr. Cottingham brought greetings from Canada, expressed appreciation for the valuable help received from highway engineers of this country through the free and cooperative exchange of information, and described some of Canada's problems and the current road program.

Highway Financing

The theme of the second session was highway financing. Roy E. Jorgensen, Deputy Commissioner and Chief Engineer, Connecticut State Highway Department, presided. In his remarks, Mr. Jorgensen pointed out that the critical financial problem has not been made clear to either legislators or the public. Highway officials have lacked the ability to put a well planned complete program before them. Toll roads, all agree,

(*Continued on next page*)

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Highway Officials Convene in Boston

(*Continued from preceding page*)

are not conducive to a coordinated highway system, Mr. Jorgensen said, but they do show that motorists are willing to pay for good highways. Specific projects have been presented to the public, and have won its support, but as yet the public has not been shown that there is a whole highway system to buy.

Administration is at present the weakest point in highway development, Hon. Thomas H. MacDonald, Commissioner of the U. S. Public Roads Administration, told the delegates. No amount of money will provide the needed roads without the best and most efficient administration in the highway departments, he said.

Since highway departments were first set up, many new phases of activity have been added—mostly administrative, the Commissioner pointed out. Planning units, soils-study and engineering divisions, traffic-control units, and secondary-road divisions are among those additions. Highway departments are no longer agencies whose sole purpose is building and maintaining state roads; they are becoming economic and research organizations as well. Accordingly, their administration has become increasingly important.

In the North Atlantic states, particularly, Commissioner MacDonald said, relief of traffic congestion in urban areas is a most pressing problem. In those states live 41 per cent of the urban population of the entire nation. Another increasing problem is that of maintenance. In 1948, 72 cents was spent on maintaining our highways for every dollar spent on construction. These rising maintenance costs are cutting into reconstruction funds, and present still another aspect of the complicated highway-financing problem.

Commissioner MacDonald paid tribute to Dean N. S. Shaler of the Lawrence Scientific School, Harvard University, whose book "American Highways", published in 1896, set forth the basic principles of highway engineering. We have not yet achieved some of his recommendations, but we are progressing towards them, the Commissioner said. Dean Shaler, who gave the first course in highway engineering in this country, also introduced road-materials testing equipment in this country, and was the first to apply science to highway construction.

A new and broader view of the highway-financing situation was presented by Wilfred Owen of The Brookings Institution. Mr. Owen, who has received a Highway Research Board Award for his study of highway finance, approaches the problem from the point of view of the total highway transportation industry. The objective in highway transportation, he said, is the same as that in all economic activity—to use our ingenuity and skills to supply what we want at the least possible cost.

We spend $30,000,000,000 a year to keep ourselves on the move. About one-tenth of this is spent on highways, while nine-tenths are spent for cars, tires, gasoline, etc. The amount spent on the highways themselves is certainly not in proportion to their importance. But, Mr. Owen said, the expenditures for vehicles, tires, gasoline, etc., depends on the character of the roads. Though perhaps not as obvious as in the early days of our highway system, better

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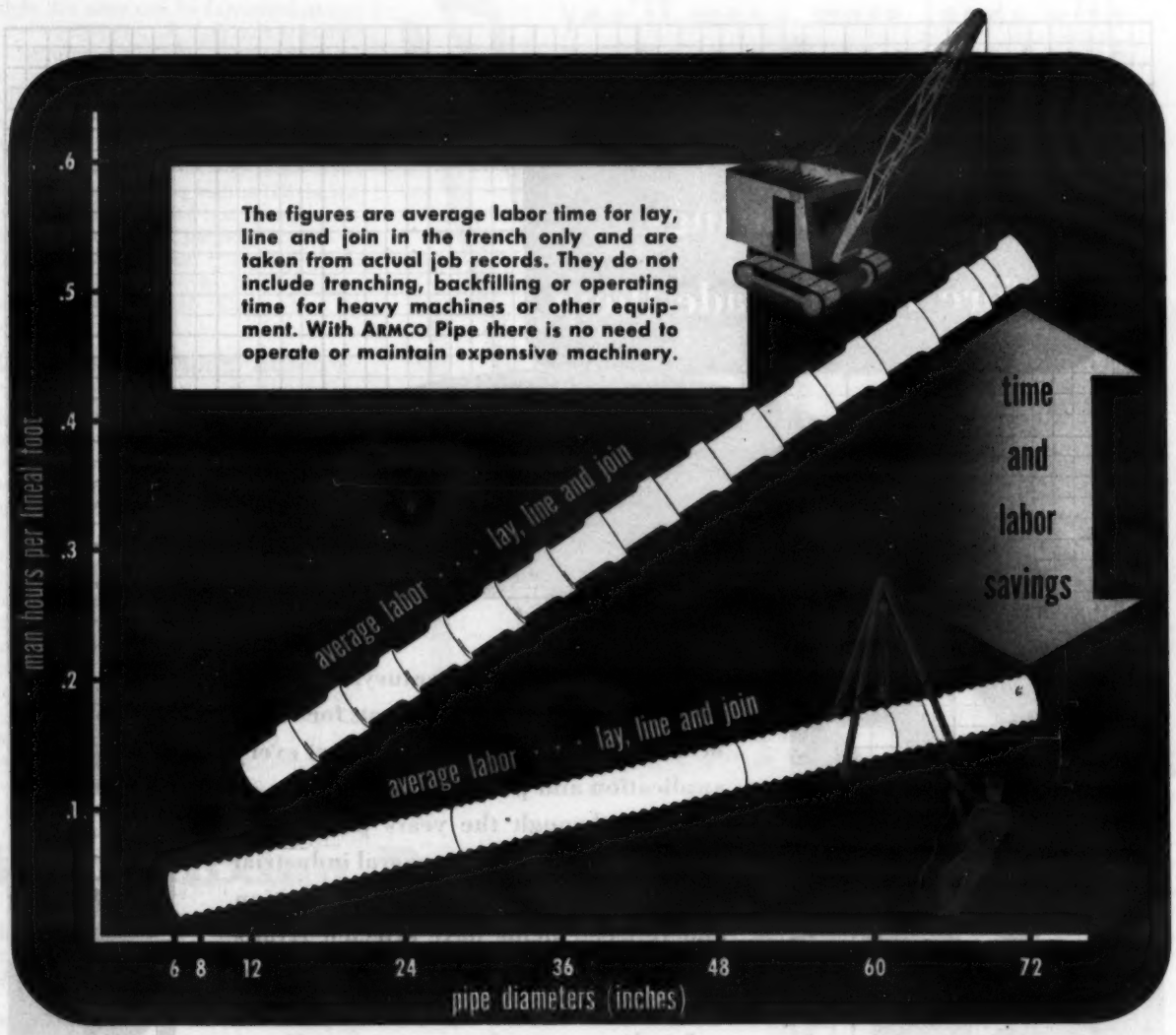
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highways mean lower operating costs.

When our highway system began to develop, savings in the operating cost of cars were added to the funds for highways. A case in point is gasoline—as its cost went down, the gas tax was levied for highway purposes. But in 1940, the price of gas with a 7-cent tax was less than the 1920 price with no tax. Under this system, a part of each highway transportation dollar was set aside for the highway system. However, after 1930, even though technological developments continued to reduce the cost of cars, tires, gas, etc., we stopped putting any more of the savings into our highway system. Mr. Owen raised the questions: Was that an appropriate time to stop? And is 10 per cent enough for our highways? He thinks not, and pointed out that the public is now losing those savings because of the rise in operating costs due to inadequate roads.

We have become confused in our thinking; we have lost sight of the fact that cars in themselves don't provide efficient transportation, said Mr. Owen. The motorist pays 1/5 cent per mile for his highways and 5 times as much for insurance. The highway problem is one of arithmetic, he stated; there is a choice of spending 2/5 cent for better highways, or of continuing to spend 1/5 cent for highways and another 1/5 cent in higher operating costs to make up for bad roads. The public, Mr. Owen said, is interested in the total cost for highway transportation—not in the division of funds. In Mr. Owen's opinion, we have gone about raising highway funds in a vacuum, with insufficient consideration of the other aspects of highway transportation.

In recent years, these other items in highway transportation have gone up, but the charge for highways has not. Mr. Owen's study of the problem has convinced him that the best results are not being obtained with the present set-up of expenditure of total highway transportation funds.

One solution may lie in better highway management. When this management becomes comparable with that in private industry, and it is evident that there still are too few funds, the highway industry will have a case to take to the public. The highway business, he said, is a monopoly, and all monopoly—due to lack of competition—is likely to become inefficient. It may be, Mr. Owen said, that toll roads are an effort to break that monopoly.

It is false economy, he said, not to improve our highways and lower transportation costs. And we can't enjoy the fruits of automotive progress if the savings are swallowed up to offset lack of progress in our highway system.

Mr. Owen's conclusions were:

1. Of all the elements in highway transportation, provision of highways has shown the least progress in getting the most for the cost.
2. We must spend more of the highway transportation dollar for roads, where there is real efficiency in highway management.
3. Through a reallocation of funds, we can pay more for highways without paying more for highway transportation.
4. Highway transportation is a national asset; we cannot afford to let a $30,000,000,000 business stagnate.

Due to an accident, Norman MacDonald, Executive Director of the Massachusetts Federation of Taxpayers Association, was unable to present his scheduled talk on highway financing from the taxpayers' point of view. Spencer Miller, Jr., State Highway Commissioner of New Jersey, went to bat for Mr. MacDonald. He reported that Massachusetts taxpayers recognize the need for increasing highway-user taxes to provide adequate funds for highway improvement, and favor the proposed Massachusetts $100,000,000 bond issue for highways.

Mr. Miller asked highway officials to raise their own sights and then those of the public. A capital revolution has been taking place in this country, he said, with one form of transportation being substituted for another. This places upon highway officials the responsibility of putting before the public all the facts of the situation and the resulting problems and needs. They must think in terms of expansion, and capture the public's imagination to secure funds to do the job the public is demanding. Highway departments are engaged not in building roads but in providing a transportation system. There is no longer a choice of whether or not to construct highways, because without an adequate highway system, the dynamic economy of this country cannot long survive, he concluded.

Truck Sizes and Weights

Because it is one of the vital problems facing highway officials today, one entire session was devoted to a round-table discussion of truck size and weight limitations. Robert M. Reindollar, Chairman of the Maryland State Roads Commission, was moderator, and those participating were: W. A. Warrick, Chief Construction Engineer, Pennsylvania Department of Highways; Hoy Stevens, Chief, Equipment & Operating Section, American Trucking Associations, Inc.; D. K. Chacey, Highway Engineer, Transportation Corps of the Army; Lacy V. Murrow, Assistant to Vice President, Association of American Railroads; and Hal H. Hale, Executive Secretary, American Association of State Highway Officials.

(*Continued on next page*)

"We had to pick up a pilot to get us through the rainy season."

Bethlehem Reinforcing Bars in bridge deck. Nearly 45 tons of reinforcing steel were used in this structure.

Straightening Out U.S. 220

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Inserting installing-cap over Bethlehem Dowel Unit. In finished lane this unit will function as contraction joint.

Completed bridge ready for traffic. Bethlehem Cable Guard Rail, mounted on steel posts at bridge approaches, provides constant protection for motorists.

An after-lunch chat. Left to right: Al Diehl and Joseph Schuessler, inspectors, both of Pennsylvania Department of Highways; Robert Rosser, contractor; and Emory Grove, foreman.

One of the many road-modernization projects undertaken in recent months by the Pennsylvania Department of Highways was a 4427-ft stretch of U. S. 220, located in the Cessna, Pa., area. The two-lane job included a bridge, and was handled by Rosser Construction Co., of Mt. Joy, Pa. Bridge reinforcing, bar mats, dowel units and cable guard rail were supplied by Bethlehem. Various phases of the construction are shown in the accompanying pictures.

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Highway Officials Convene in Boston

(Continued from preceding page)

Each member of the panel reviewed the matter of truck sizes and weights from the point of view of the organization he represented. From the highway department point of view, limitation on truck sizes and weights is a "must" to protect the investment in highways and prevent excessive damage to roads not designed for today's truck sizes and loads. Since it is impossible to replace all the old roads immediately, the only solution from the highway officials' point of view is to limit the loads traveling over those roads.

The carriers are not happy about some of the unrealistic load limitations which have been imposed, Mr. Stevens reported; he asked for more understanding of the carriers' problems in restrictions affecting payloads. Mr. Chacey, speaking for the Army, described the types of Army vehicles and stated that Army's transportation objective is to move the greatest possible payload at the least expenditure of time and man-power. In selecting and specifying its vehicles the Army is ever mindful of the wear and tear on the highways subjected to heavy Army transport movements, and the maintenance involved. The important point, as the Army sees it, Mr. Chacey said, is that highway projects do not necessarily provide a highway system, and the Army's interest is in the highway system.

Mr. Murrow stated that the railroads have a dual interest in the subject, both as operators of highway transport and as competitors in the transportation field. He stressed the wisdom of viewing the *whole* transportation picture in the light of its importance to the national economy, and of being guided by what appear to be the best interests of all concerned. "No policy or practice not in the public interest can long endure", he said.

Mr. Hale reviewed AASHO policy on size and weights of trucks and outlined the development of its present standards. In these, the Association's prime interest was the public interest, he said, since the public foots the bill for the highway system—through taxes and through payment for commodities hauled over the highways. There are three major groups concerned with truck sizes and weights, Mr. Hale pointed out—highway officials, manufacturers of transportation equipment, and the carriers or users of that equipment. Each of these groups is caught between conflicting interests. In the case of the highway official, these interests are his job of constructing and maintaining our roads, the objective of public service, and the carriers.

Since highway officials can only recommend limitations on truck sizes and weights, the final decision rests with the legislature in each state. From the discussion, however, it was clear that the only solution to the problem lies in taking a broad view of the entire transportation picture, reaching a clearer understanding of the viewpoint of each of the groups concerned, and making some compromise on conflicting interests for the sake of public service and national welfare.

Other Subjects Discussed

A wide variety of other topics were

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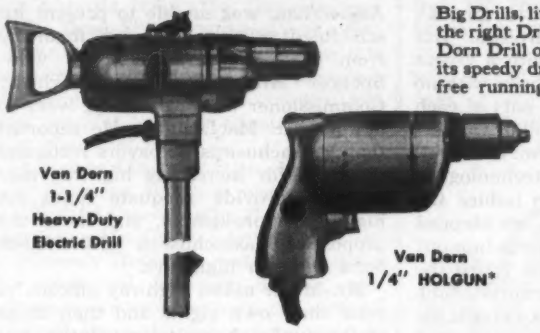

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9	3⅛"	2.50
10	3¼"	2.50
11	3½"	2.75
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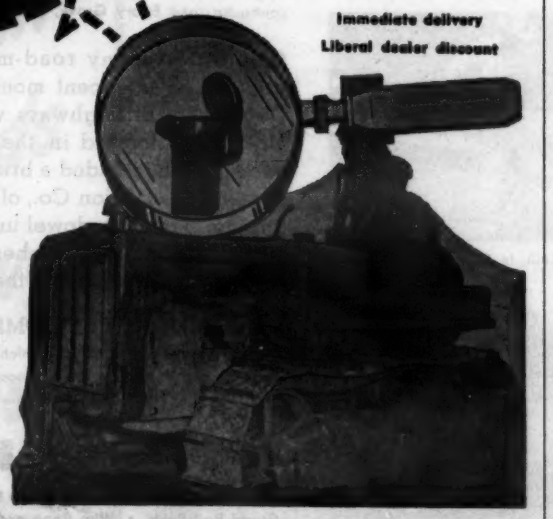
14	4½"	3.00



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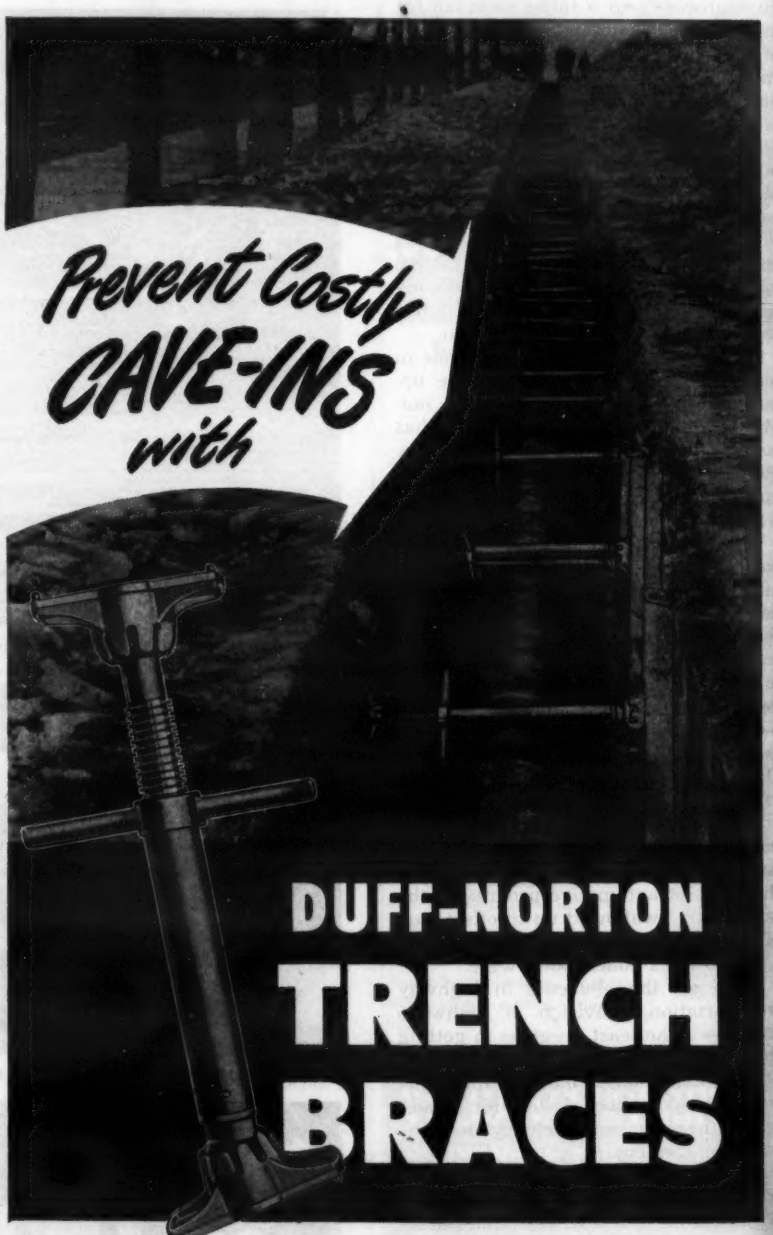

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discussed in the remaining sessions. J. J. Jenkins, Jr., Project Engineer, J. E. Greiner Co., Baltimore, Md., described the planning, design, and building of the Mystic River Bridge now under construction between Charleston and Chelsea, Mass.

Studies made for the Massachusetts Department of Public Works to determine the best types of equipment and procedures for aerial photography for use in highway location were described by Elmer C. Houdlette, Associate Civil Engineer in the Department.

Observations from field inspections of cement-concrete pavements were presented by Charles W. Allen, Research Engineer of the Ohio Department of Highways. He described special studies of the effect of expansion-joint spacing; of blow-up; of scaling; and of pavement pumping.

W. B. Getchell, Jr., Executive Director of the Maine Turnpike Authority, discussed the Maine Turnpike—the reasons for its construction, its design, financing, and operation. Mr. Getchell stated that, in view of Maine's highway needs and limited funds, the construction of the Turnpike seemed to be a practical solution to the problem. He pointed out that the Turnpike does not replace any part of the State's highway system; rather it supplements it by providing an optional route for the use of which people elect to pay. Since it is a self-liquidating project, paid for only by the people who use it, the State's borrowing power has been preserved for other uses, he said.

The design and control of dense graded bituminous concrete was the subject of a paper by W. K. Boyd, U. S. Army Waterways Experiment Station, Vicksburg, Miss. And Harold J. Duffy, Chairman, Technical Committee, Metropolitan Project Committee of State Planning Board, discussed the master highway plan for the Boston area.

The importance of selling the highway program to the public was mentioned by many of the speakers, and was the subject of an entire paper at the final session. This was presented by J. B. McMorran, Chief Engineer of the New York State Department of Public Works. Mr. McMorran outlined the present highway situation, and the reasons that our highway system has not kept pace with motorists' demands. He pointed out that highway officials must be salesmen too, and stated that once the public learns the facts, it will support an adequate highway program.

New Officers

Officers of the Association for the coming year are: President, John C. Burnham, Assistant to Chief Engineer, Maine State Highway Commission; Vice President, Ray F. Smock, Secretary of Highways, Pennsylvania; Secretary and Treasurer, A. Lee Grover, Secretary, New Jersey State Highway Department, who was re-elected to these offices.

The Board of Directors includes Lucius D. Barrows, Chief Engineer, Maine State Highway Commission; F. E. Everett, Commissioner of Highways, New Hampshire; H. E. Sargent, Commissioner of Highways and Chief Engineer, Vermont; William F. Callahan, Commissioner, Massachusetts Department of Public Works; George H. Henderson, Principal Highway Engineer, Rhode Island Department of Public Works; G. Albert Hill, State Highway Commissioner, Connecticut; H. O. Schermerhorn, Consulting Engineer, New York State Department of Public Works; R. B. Traver, County Superintendent of Highways, Onondaga County, N. Y.; Spencer Miller, Jr., State Highway Commissioner, New Jersey; A. Lee Grover, Secretary, New Jersey State Highway Department; Ray F. Smock, Secretary of Highways, Pennsylvania; W. A. McWilliams, Chief Engineer, Delaware State Highway Department; R. M. Reindollar, Chairman, Maryland State Roads Commission; and J. N. Robertson, Director of Highways, District of Columbia.

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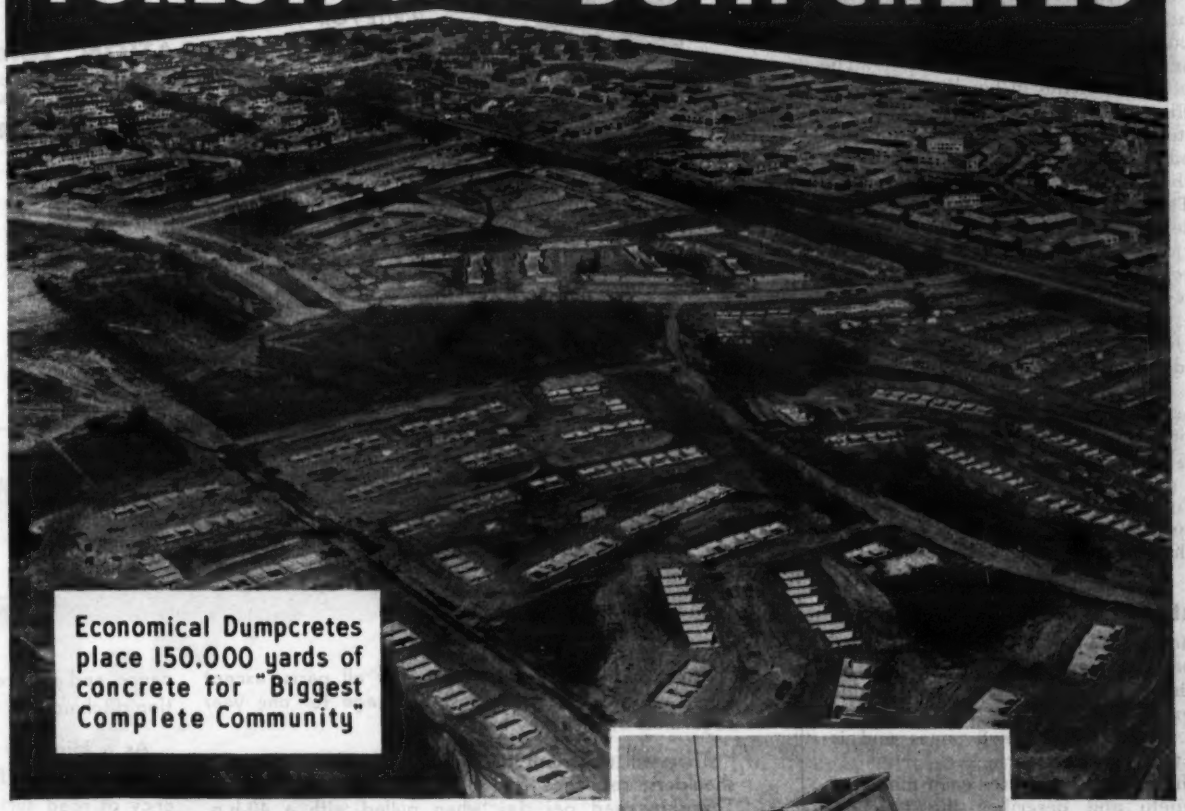

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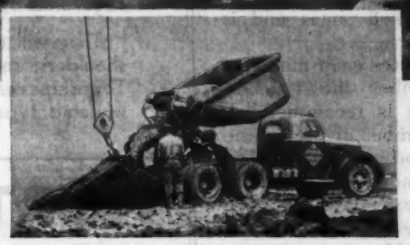

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Park Forest Homes (a city-to-be of 30,000 near Chicago) picked a reliable contractor to furnish its 150,000 yards of concrete. And Corbetta Construction Company picked a reliable concrete body—the Dumpcrete—to place it.

Corbetta's on-the-job mixing plant and seven Dumpcretes *average* 1750 yards per week!

Every yard of this air-entrained concrete meets rigid specifications. No extra air is whipped in by the non-agitating Dumpcretes on the way to the pour. Top-to-bottom, load-to-load uniformity is the rule.

Why did Corbetta pick the Dumpcrete? . . . They wanted speed, low cost and a body that would do anything. The Dumpcretes load fast and dump fast. They haul hour after hour, day after day without downtime or expense. With their *extra high* discharge they place directly into buckets; or chute 13 ft. for foundations, footings, walks and streets.

You can have speed, economy and flexibility on your next job too . . . whether it's *big* or *small*. The low-cost Dumpcrete is the answer. Get proof . . . send for the facts today.

THIS IS THE DUMPCRETE — the concrete body that placed 1½ million yards last year. The lower cost Dumpcrete is lightweight, watertight, with 13-foot chute, controlled higher discharge and lower center of gravity. Users report savings up to $1.00 a yard. Hauls sand, gravel and earth too.

Send me booklet "Contractors Pour Faster, at Lower Cost."
Name_____
Firm_____
Address_____

DUMPCRETE
DIVISION, MAXON CONSTRUCTION CO., INC.
528 Talbott Bldg., Dayton 2, Ohio

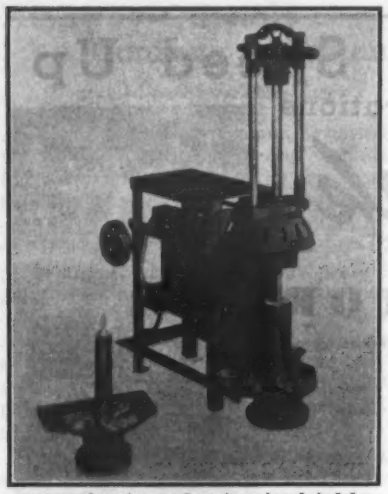
For the Finest in Chain Saw Performance — Lombard Model 7 Two Man Saws with new Warren High Speed Chain

Dealer opportunities in some areas.

- Cuts easier because of governed chain
- Cuts faster result of unique plow-shaped teeth
- Cuts longer without dulling Teeth made of tool steel
- Local demonstration arranged!

Also One Man Saw—Available Soon

LOMBARD GOVERNOR CORP.
ASHLAND, MASSACHUSETTS



Using abrasive and water circulated by a revolving drill-tube bit, the Howe-Simpson Model H-S 12 concrete drill grinds out holes from ¾ to 2¾ inches in diameter.

Concrete Drill Uses Abrasive and Water

A new-model portable concrete drill has been developed by Howe-Simpson, Inc., 136 E. Gay St., Columbus 15, Ohio. It is recommended by the company for obtaining test cores as well as for drilling holes. According to the manufacturer, the unit will drill through reinforced concrete, stone, marble, and other hard or brittle materials. The Model H-S 12 is designed to drill holes from ¾ to 2¾ inches in diameter. The bits are 12 inches in length. Other H-S drills are the Model 14 for holes from 1 to 4 inches in diameter, and the Model 6 for holes from 3½ to 6¾ inches.

The Howe-Simpson drills grind a hole by the use of water and an abrasive—silicon carbide—circulated by a revolving drill-tube bit. The water bowl is located so as to permit drilling close to walls—within 4 inches, or less—the manufacturer states. The Model 12 is powered by a ½-hp electric motor with a V-belt drive running over a 3-speed cone pulley. It is 3 feet 5 inches high, 2 feet 4 inches long, and 12½ inches wide. Operating weight is 155 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 60.

Catalog Describes Magnetos

More than 27 different models of Super-Spark magnetos are listed in Bulletin FM-75C currently available from Fairbanks-Morse & Co., Beloit, Wis. The bulletin is 8 pages and is printed in two colors.

The catalog illustrates each model of magneto and describes the type of service for which it is recommended. It tells the model number of the engine to which it is adapted and the type of flange or coupling mounting required. Short descriptive text passages give complete data on the construction and use of Fairbanks-Morse magnetos. Many unlisted applications of these magnetos can also be made.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 30.

Hand Degreasing Unit For Small Metal Parts

A degreasing unit for cleaning small metal parts is announced by the Detrex Corp., P. O. Box 501, Detroit 32, Mich. The Model 625 degreaser is a two-dip hand-operated unit which can be heated by steam, gas, or electricity. It can also be furnished for combination gas-and-steam or gas-and-electric heating. As a feature of the unit, its main-body construction is standardized so that it can be quickly converted from one type of heating to another to take advantage of whichever fuel happens to be more economical.

The Detrex 625 employs the immersion-solvent-vapor degreasing process originated by the company. It is designed to remove grease, oil, and similar materials and to leave metal surfaces, both internal and external, thoroughly clean and dry. In operation, the parts are lowered into the boiling solvent, transferred within the machine to a cool solvent rinse compartment, and then removed through the solvent vapor zone. The Perm-A-Clor solvent used is non-flammable; it will not burn or explode, Detrex points out.

Production capacity is rated at 1,000 pounds of steel parts per hour. The unit will immersion-clean anything that will go into a space of 18 x 21 x 12 inches. Shafts up to 4 feet in length can be cleaned by suspending them in the vapor zone. Floor space occupied by the Model 625 is about 10 square feet. The unit's net weight is approximately 500 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 78.

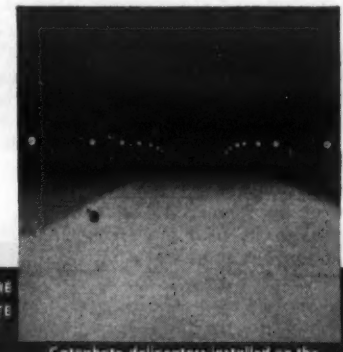
Research Head for Airco

Dr. G. V. Slottman has been appointed Director of Research and Engineering for Air Reduction Co., Inc. He has been with the company since 1934.

Absolute Proof

that CATAPHOTE GLASS buttons are the LOWEST COST means of reflectorizing signs!

YEARS OF CONTINUOUS SERVICE (from 1940 until now) ON THE PENNSYLVANIA TURNPIKE WITH NO REPLACEMENT OF CATAPHOTE REFLECTOR BUTTONS AND STILL GOING STRONG!



Cataphote delineators installed on the Pennsylvania Turnpike in 1940.

WRITE FOR COMPLETE CATALOG

CATAPHOTE CORPORATION, Toledo, Ohio

REFLECTORIZED SIGNS AND SIGNALS • GALVANIZED SIGN POSTS • PARKING SIGNS
STREET NAME SIGNS • DANGER SIGNALS • BUTTONS & CHAINS

The **"HUSKY"**

All-Purpose Road Grader, Maintainer, Ditcher and Terracer

These Huskies are so strong that all parts, except tires, are guaranteed against breakage for one year regardless of why they break.

They will clean out the ditches, cut the sod on the shoulders, resurface and prepare a mile of ordinary Township road per day when pulled with a 40-h.p. wheeled type tractor. Excellent for shoulder maintenance, and are proving most satisfactory on farm irrigation ditching and terracing work.

As a Highway Maintainer they are unexcelled for speed and extra fine work as they eliminate the tendency of road surfaces to washboard. When one-man operated they will cut maintenance costs in half.

Manufactured by

NORTHFIELD IRON COMPANY NORTHFIELD, MINNESOTA

Write Department B.B.

MARTIN *CARRYHAUL* TRAILERS

TRADE MARK REGISTERED

MARTIN CARRYHAUL TRAILERS
"Make Hauling A Pleasure!"

Ease of loading, dependability and economical operation are three Martin CARRYHAUL Trailer characteristics which make them the leaders in the field.
Regardless of your hauling job, there's a proper size Martin CARRYHAUL Trailer to do it for you safely and economically.

Your "CATERPILLAR" Dealer is your MARTIN Dealer. See him for your trailer needs.

MARTIN MACHINE COMPANY
KEWANEE, ILLINOIS

Advertise your used equipment in the

"Trading Post"

See pages 110 and 111

Send your ad to:

Contractors & Engineers Monthly
470 Fourth Ave., New York 16, N.Y.

Distributor Doings

Dealers Exhibit at Highway Show

Several New England equipment distributors were among the twenty-four exhibitors at the 25th annual convention of the Association of Highway Officials of the North Atlantic States in Boston, March 1-3. Hedge & Mattheis Co. of Boston had available at its booth literature on its varied lines of construction equipment, and featured movies of the Scoopmobile and of Byers excavators in action.

Perkins-Eaton Machinery Co., Caterpillar distributor in the Boston area, showed three Caterpillar films—"Materials on the Move", "Alcan Highway", and "Boss of the Bulldozers".

Other dealers with exhibits were Sandberg Equipment Co., distributor for Gravely tractors and Malsbary equipment cleaners; Perrin-Seaman's & Co., Inc., which featured Richmond Screw Anchor Co. products; and Hercules-Campbell Body Co., distributor for Hercules Steel Products Co.

Dealers for Blaw-Knox and Foote

Four exclusive distributors have been appointed by the Blaw-Knox Co. and its subsidiary the Foote Co. Le Roi-Rix Machinery Co., 6403 E. Slauson Ave., Los Angeles, will cover the entire southern California and southern Nevada territory. Western Equipment Co., 4009 Fairview Ave., Boise, Idaho—with branches in Idaho Falls, Idaho, and Spokane, Wash.—will cover the entire state of Idaho, eastern Washington, and southeastern Oregon. R. B. Wing & Son Corp., 384 Broadway, Albany, N. Y., will handle northeastern New York. And in Canada, Blaw-Knox and Foote have appointed Laurion Equipment Ltd., 1801 St. Patrick St., Montreal, Quebec. Laurion will handle the Province of Quebec and eastern Ontario.

The Blaw-Knox and Foote line of construction equipment consists of subgraders, spreaders and finishing machines, portable aggregate and bulk-cement plants, street and paving forms, clamshell buckets and concrete buckets, truck-mixers and truck-mixer loading plants, MultiFoote pavers, Adnun Black Top Pavers, and Kinetic Mixers.

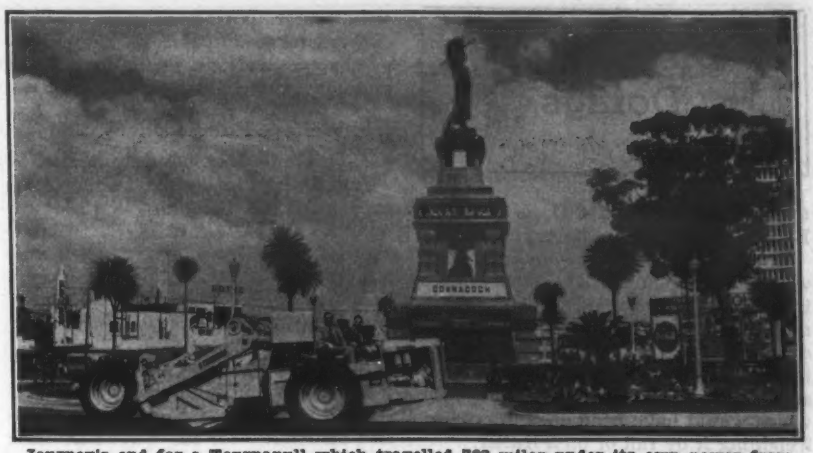
Bond Co. to Handle Clark Line

The Bond Industrial Equipment Co. of New York City has been appointed a distributor by the Clark Equipment Co. Bond is located at 51 Clarkson St. and will handle the complete line of Clark fork-lift trucks and towing tractors. Jules Michael is President of the company.

Two Dealers Appointed by Koehring

Two dealers have been appointed by the Koehring Co. The entire state of North Carolina will be covered by the Mitchell Distributing Co., with offices in Spruce Pine and Raleigh. Mitchell will handle the complete Koehring line of heavy-duty construction equipment, along with the products of the three Koehring subsidiaries: C. S. Johnson, Kwik-Mix, and Parsons.

Western Construction Equipment Co. has been appointed distributor for Parsons Trenchliners in the Montana and northern Wyoming area. It also handles the Kwik-Mix and Koehring heavy-duty construction equipment. The company maintains offices in Billings and Missoula, Mont.



Journey's end for a Tournapull which travelled 763 miles under its own power from Laredo, Texas, to a Mexico City dealer, Construccion y Maquinaria.

Mexico City Dealer Couldn't Wait: Drove Scraper From U. S. Border

A dealer who couldn't wait—that's Construccion y Maquinaria, S. A., who took delivery of a Tournapull-scraper unit on the United States side of the border rather than wait for rail permits and other red tape. The Mexican distributor drove the unit under its own power all the way from Laredo, Texas, to Mexico City, D. F.—a distance of 763 miles.

The trip took 46 hours, and was accomplished at an average speed of 16.6 mph. The heavy-duty earth-moving unit consumed 154 gallons of diesel fuel for an average of 3.4 gph. The dealer's representative was accompanied on the

(*Concluded on next page*)

HOISTS
•
DERRICKS
•
WINCHES

A Complete Line of Builders' Derricks and Winches—nationally known for dependable service and long life.

Write for Catalog or send your problems to our Engineering Department

The Sasgen line is handled by leading equipment distributors everywhere.

SASGEN DERRICK COMPANY
3101-27 W. Grand Avenue, Chicago 22, Ill.

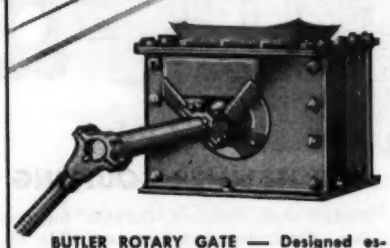
AGGREGATE IS A NOTORIOUS GATE CRASHER!

TREMENDOUS impact and tremendous wear, — those are the forces against which all gates on concrete plants, batching plants and sand and gravel plants must fight.

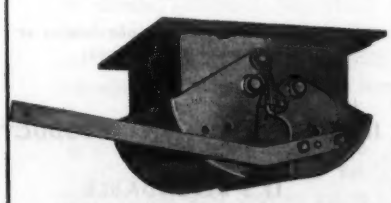
High volume production demands filling and discharge gates that operate smoothly, quickly and accurately; — gates *engineered* to take punishment and like it.

Long-lived BUTLER Gates are jam-proof and clog-proof. And quick-acting BUTLER Gates actually increase an operator's speed, — all characteristics that mean a welcome, extra profit.

BUTLER foresaw the upward swing in concrete production and diverted critical steel to building a stock of gate equipment. A limited stock, — it's true, for steel deliveries are still uncertain, — but for those who place their orders now, immediate shipments are possible.



BUTLER ROTARY GATE — Designed especially for handling cement. Carefully machined rotor fits tightly yet operates easily, — allows no leakage. Rotor may be removed for cleaning.



BUTLER CLAMSHELL GATE — Ideal for sand, gravel, crushed stone. All steel construction, electric arc welded. No cast gears to break or jam. Easily and quickly operated by a simple, fast-acting toggle.

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

Distributor Doings

(*Continued from preceding page*)

trip by Dover Fouts, Le Tourneau Export Sales Engineer.

The rig is one-man-operated and weighs 20,700 pounds. Its electric-steering mechanism enabled it to negotiate normal city and highway traffic. By driving it through under its own power, the dealer secured shipping economies and eliminated delays and expense which would have been encountered in freighting it by rail or on a trailer.

Baltimore Dealer for Hyster Co.

McCall-Boykin Co., Inc., Calvert and 20th Sts., Baltimore, Md., has been selected as a distributor by the Hyster Co. McCall will handle sales and service in all of Maryland except Washington, Allegany, and Garrett Counties; in Kent and Sussex Counties of Delaware; in Accomac and Northampton Counties in Virginia; and in the District of Columbia. Equipment handled will include Hyster lift trucks, straddle trucks, and mobile cranes.

Diamond Chain Appoints Dealers

Diamond Chain Co., Inc., Indianapolis, Ind., has announced the appointment of four dealers. Chase, Parker & Co., Inc., 288-290 Congress St., Boston, Mass., will service the Boston area. In the Chicago district, Diamond has appointed the Apex Power Equipment Co., 4047 W. 26th St., and Ray M. Ring Co., 1234 W. Washington Blvd. W. F. McGraw & Co., 575 E. Milwaukee St., Detroit, has been named distributor for that area.

Diamond manufactures a line of roller chains, sprockets, flexible couplings, and conveyor chains.

J. P. Waite to Handle Davey Line

J. P. Waite, Inc., has been named to a full dealership by the Davey Compressor Co., Kent, Ohio. Waite headquarters are at 3304 W. Pierce St., Milwaukee, Wis. The company will handle all items in the Davey line of compressors, mobile machine shops, and portable lighting equipment.

Whitco Appointed by Gar Wood

Whitco Truck Equipment Co., Louisville, Ky., has been named an authorized distributor for the Wayne Division of Gar Wood Industries, Inc. Whitco, which is owned by William T. Cochrane and Bertram F. Whitbread, is located at 930 Mason St. The Wayne Division manufactures a line of hydraulic hoists, dump bodies, winches, cranes, truck tanks, and other items.

Stephens-Jones Adds Two Salesmen

Stephens - Jones, Inc., construction-equipment dealer in Iowa, has hired two new salesmen. Lewis Young, Jr., will be stationed at the company's branch office at 1909 E. 4th St. in Sioux City. Orlin P. Sorenson will work out of the main office at 818 S. W. 9th St. in Des Moines. Mr. Sorenson is located at New Hampshire, Iowa.

Hydro-Line Appoints Gobeil Co.

C. E. Gobeil Co., 2635 University Ave., St. Paul, Minn., has been appointed a representative of the Hydro-Line Mfg. Co. Gobeil will have exclusive rights in the states of Minnesota, North Dakota, and South Dakota, and that part of Wisconsin west of and including cities on U.S. Route 51 and south to a line parallel with the Minnesota-Iowa state boundary line.

Light-Steel Design Manual

A design manual for light-gage steel has been issued by the Committee on Building Codes of the American Iron & Steel Institute. Based on a 10-year research program conducted at Cornell University, the manual supplements the official "Specification for the Design of Light Gage Steel Structural Members", issued in 1946.

The manual contains tables of the properties of basic sections; charts on effective designs; sketches of effective cross sections; and a description of the various terms and design formulae employed. It lists commonly used symbols, examples of various designs, and other information.

Copies of this 78-page manual are available by writing to the Institute offices at 350 Fifth Ave., New York 1, N. Y. Cost of the book is $1.00.

15,000 V. P. M. IN CONCRETE

with FLEXIBLE SHAFT SPEED OF ONLY 3,600 R. P. M.

This amazing step-up in frequency of the vibrator head is made possible by a patented, non-eccentric rotor device found only in Vibro-Plus "Rollgear" vibrators.

50% higher frequency guaranteed—Low speed flexible shaft

- save as much as a bag of cement per cu. yd.
- concrete of uniform strength and density
- less mechanical wear and tear
- longer unit life

No time is lost for periodic stripping down. The flexible shaft can be lubricated in less than 20 seconds. *The Vibrator Head Runs Dry.* No clamping or screwing needed at the power source.

"Rollgear" is designed and built for long, uninterrupted work periods.

ELECTRIC GASOLINE PNEUMATIC

VIBRO-PLUS CORPORATION

Internal and External Vibrating Equipment

243 West 55th Street, New York 19, New York

CUT COSTS . . . on Tough Air Tool Jobs

"GJ-BOSS"

AIR HAMMER COUPLING

Ground joint construction—no worn or mislaid washers to replace. Built for heavy duty and hard wear. Furnished with strong "Boss" Interlocking Clamp. Large wing nut facilitates connecting and disconnecting. Compact and heavy types. Cadmium plated—rustproof. For washer style, specify "Boss" Air Hammer Couplings.

DIXON

AIR HAMMER COUPLING

Washer style. Efficient, durable, inexpensive. Steel stem has deep, smoothly finished corrugations. Rugged malleable iron clamp has dual gripping ridges on inner surface. Compact and heavy types. Cadmium plated—rustproof. Also available in ground joint construction—specify "G J-Dixon" Air Hammer Couplings.

Stocked by Manufacturers and Jobbers of Mechanical Rubber Goods

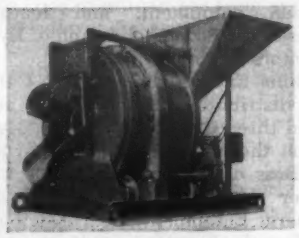
IF IT'S A DIXON PRODUCTS IT'S DEPENDABLE

DIXON VALVE & COUPLING CO.

Main Office and Factory: PHILADELPHIA, PA.

BRANCHES: CHICAGO, BIRMINGHAM, LOS ANGELES, HOUSTON

MONEY-MAKING MC MIXERS

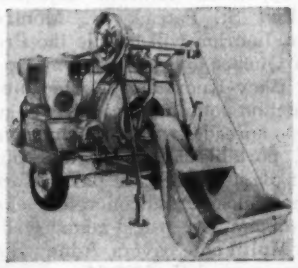


CMC 56-S TWO-YARDER

Specifically designed to facilitate increased Central Plant production on big jobs or in commercial plants. Advanced CMC engineering and features assure FASTER, SMOOTHER, and MORE EFFICIENT operation. Equipped with Timken Bearings throughout. Renewable hardened steel drum liners and hard alloy coated discharge buckets insure extra long life. Hydraulic finger-tip controlled charging and discharging.

NEW CMC 16-S HYDRAULIC

New hydraulic charging makes this new CMC 16-S Mixer the SMOOTHEST, EASIEST-OPERATING mixer on wheels. All spools and cables vulnerable to wear and breakage eliminated. Does away with intricate clutch and brake adjustments. Truly the modern approach to mixing perfection.



CMC 6-S TRAILER

HERE IS THE MOST VERSATILE MIXER ON WHEELS. Superior CMC design assures faster charging. This high-speed, non-tilt unit incorporates all the plus-value features that have made CMC mixers "tops in the field."

Write today for latest illustrated catalog and prices.

CONSTRUCTION MACHINERY COMPANIES WATERLOO, IOWA

HOTEL STRAND

ATLANTIC CITY'S HOTEL of DISTINCTION

Devoted to the wishes of a discriminating clientele and catering to their every want and embracing all the advantages of a delightful boardwalk hotel.

Spacious Colorful Lounges—Sun Tan Decks atop—Open and inclosed Solaria—Salt Water Baths in rooms—Garage on premises. Courteous atmosphere throughout.

When in Atlantic City visit the FAMOUS FIESTA LOUNGE RENOWNED FOR FINE FOOD

OPEN ALL YEAR

Under Ownership Management

Exclusive Penna. Ave. and Boardwalk

Contractors Hold Their 30th Annual Meeting

(*Continued from page 1*)

Construction Forecast for 1949

AGC Managing Director H. E. Foreman stated in his annual report to the convention that there were the potentials for a record-breaking volume of $18,750,000,000 in new construction during 1949, and an additional $6,000,000,000 in maintenance and repair operations. With the expectation of more adequate materials and equipment, more skilled workmen, more competition, and no major upsets to the national economy, the construction industry should be able to execute this larger volume of work faster and more efficiently during 1949 than in any year since the end of the war, he added.

Foreman also disclosed that general contractors, through the association locally and nationally, are making valuable contributions to the national defense. "In cooperation with the Corps of Engineers, members and chapters are helping to sponsor, recruit, and train 100 Army reserve construction units as part of the Department of the Army's Affiliation Program. So far 86 of these units have been sponsored, and 74 have been activated," Foreman reported. "These units", he went on, "will be available for immediate mobilization in the event of a national emergency. Each man is specially fitted for his Army assignment by his civilian employment. When mobilized to full strength, the 100 units would total almost 60,000 officers and men."

Economic Aspects

A warning against "increased taxing away of business dollars that can and should go into plant and equipment" was sounded by guest speaker Carroll M. Shanks, President of the Prudential Life Insurance Co. of America. He also called attention to "ill-considered rises in welfare taxes" and declared that they can have but one long-run effect—a gradually rising price scale or creeping inflation. Shanks pointed out that the ultimate burden of public-welfare expenditures comes back in hidden guises on the worker, the small stockholder, and others, who often do not realize what is happening to them.

Professor Sumner H. Slichter of Harvard University also emphasized that the Government could help business to carry out its investment plans through maintaining tax policies calculated to encourage rather than hinder investment. In this regard he called attention to President Truman's "major blunder" in thinking that the country is still primarily confronted with the problem of preventing inflation and advocating substantial increases in taxes. Such tax increases, the economist maintained, would create unemployment and would be contrary to the interests of labor.

"The crucial question confronting business in 1949", Professor Slichter stated, "is whether the growing reluctance of enterprises and individuals to spend can be halted before it produces a drop in total spending and a recession." To prevent this there are two principal steps which business can take, he said. One is to adjust its investment policies to present conditions, and the other is to adjust its selling policies, particularly its price policies, to present conditions. Professor Slichter advised reduction in prices to stimulate purchasing and investment. This, he maintained, would be more equitable than wage rises that would go mainly to members of the more powerful unions.

Guy C. Kiddo, Vice President of the First National Bank of Chicago, stated that with the tremendous volume of construction in highways, housing, public works, and institutional buildings which this country will need in the years ahead, there will be enough work to keep all contractors reasonably busy. The contracting business is very largely "depression-proof", he said, qualifying the remark, however, by pointing out that the current downward business trend may accelerate enough to reduce new private construction below present estimates. "However, if this occurs," he added, "it would probably be offset by a step-up in public works."

Pointing out that costs have currently put new homes beyond the reach of those who need them most, the speaker emphasized that the construction industry must broaden the market for its services. "The cost of construction is a serious matter in our national welfare," he declared. "You should not simply accept high costs as inevitable, and pass them on to owners and public authorities." The decrease in productivity of labor in recent years, as compared with the years before the war, is disturbing, he said. "The labor cost of most operations now as compared with pre-war is proportionately higher than the increase in labor rates."

(*Continued on next page*)

AGC officialdom in smiling mood—left to right, Managing Director H. E. Foreman; new President Adolph Teichert, Jr.; out-going President D. W. Winkelman; and new Vice President Walter L. Couse.

KEEP INFORMED . . .

For further information and literature on products described in this issue, turn to page 16 for the Red Request Cards. Our Reader Service Department will be glad to help you.

CONTRACTORS & ENGINEERS MONTHLY
470 Fourth Avenue
NEW YORK 16, N.Y.

UNIT 1014

10 TON TRUCK CRANE WITH DUAL POWER

BOOM IN FOLDED POSITION FOR TRAVELING

2 ENGINES

- One Engine for Speed and Mobility
- Another Engine for Lifting or Digging
- Gas or Diesel Power
- Road Speed: 32 M.P.H.
- Capacity: 10 Tons

One look at the UNIT 1014 will convince you that here is Truck Crane design at its best. Perfectly balanced, it has modern, adjustable hook-roller construction. Power flows from the truck engine in a direct straight-line drive to the tandem rear axles, both of which drive. A separate engine powers the upper structure, and may be either gas or diesel. Double, full-width outriggers provide added stability. This streamlined unit has 5 speeds forward and one reverse, with an auxiliary transmission offering 10 speeds forward and 2 speeds reverse. A road speed of up to 32 M.P.H. makes "going from job to job in a hurry" a simple matter. Large diameter, wide-faced air brakes are used on all 4 rear wheels. A hand operated, shoe type parking brake is provided on the propeller shaft. A short turning radius increases its value in close-quarter operations, and all dimensions meet highway requirements.

UNIT CRANE & SHOVEL CORP.
6309 W. BURNHAM STREET, MILWAUKEE 14, WISCONSIN, U.S.A.

● Other UNIT Models are available in ½ and ¾ Yd. Excavators and Cranes up to 15 Tons . . . Crawler or Mobile Types . . . Fully convertible to ALL attachments.

SHOVELS • DRAGLINES • CLAMSHELLS • CRANES • TRENCHOES • MAGNETS

Contractors Hold Their 30th Annual Meeting

(*Continued from preceding page*)

From financial statements in his bank's files, Kiddo disclosed that contractors' profits are quite modest when account is taken of the capital and experience required and the risks incident to the business. Representative samplings of the percentage of profits after taxes averaged 2.22 per cent for building or general contractors; 3.99 per cent for road contractors; 3.83 per cent for contractors in the mechanical trades such as heating and air conditioning, decorating, electrical, plumbing, insulation, and plastering; and 4.55 per cent for contractors in the heavy-engineering field.

"Certainly these figures do not indicate in any way that the contractors' profit margins are too great, but rather that they are too small," he added.

Government Spokesmen

Representatives of the Federal government were present to acquaint the contractor delegates with public-works developments in the construction industry. George L. Read, Chief Construction Engineer, Division of Hospital Facilities, U. S. Public Health Service, stated that the United States is embarked on the most comprehensive hospital-construction program attempted by any nation. Since the passage in 1946 of the Hospital Survey and Construction Act, over $400,000,000 in total construction costs has been approved, while about 20 per cent of the projects are already under contract and a few are completed, Read announced.

The program, whose purpose is to assist states in providing hospitals and health centers, requires state surveys of actual needs, stressing long-range planning and comprehensive state development plans, Read added. He also explained that the program authorizes Federal aid and provides for state administration of the program within the state. Government funds, which amount to one-third of the total cost of each project, are paid through the state agency to the owner on the basis of work performed.

Raymond M. Foley, Housing and Home Finance Administrator, requested the help of the contractors in his agency's economy-housing program. This, he said, was an effort at cooperative action to effect many small and large economies so that buyers could get "more house for the money".

Phillips Moore, Director, Office of Airports, Civil Aeronautics Administration, disclosed that Congress has been requested to appropriate $40,000,000 to be spent for the construction and improvement of 218 small airports and 207 large airports. But, he added, airport needs are greater than the funds which will be available for next year's construction. Of the 687 certificated air-carrier stops within the continental United States, there are 299 which are at present receiving no airline service at all due to inadequate airports, he said.

The convention was also informed of the tremendous construction program involved in the electrification of rural America, by J. K. O'Shaughnessy, Chief, Engineering Division, Rural Electrification Administration.

Thomas H. MacDonald, Commissioner of Public Roads, told of the effects of the record snowfalls on the road programs of states in the northwest, and declared that "there is certainly no reason why the highway departments should not be provided with more adequate snow-fighting equipment, and many more well placed equipment depots". He stated that already road-construction funds and general revenues of those states affected have been seriously depleted by the disaster operations of the maintenance crews and contractors' forces.

Rear Admiral J. J. Manning, Chief, Bureau of Yards and Docks, Department of the Navy, Washington, D.C., reported on tests of many types of equipment in current construction, and asked the contractors to suggest new lines of research.

Major General Lewis A. Pick, Chief of Engineers, U. S. Army, Washington, D. C., was unable to attend the convention, but was represented by Major General Douglas L. Weart, Commanding General, U. S. Engineer Center, Fort Belvoir, Va.

Labor's Voice

The voice of labor was also heard at the four-day session in an address by Richard J. Gray, President of the Building and Construction Trades Department of the American Federation of Labor. The labor spokesman criticized the Taft-Hartley Act but said that it was impossible at this time to foresee what kind of law was going to replace it. Gray also suggested more cooperation between labor and management in the construction industry. This cooperation, he said, would "make unnecessary the injection of government to the extent that it has gone lately in affairs of that kind".

Despite the greatest demand for oil in history, world production of oil has already passed by far the present world consuming ability, according to Major General Ernest O. Thompson (retired), Commissioner, Railroad Commission of Texas. General Thompson dubbed oil and construction the prosperity twins, and revealed that the oil industry is completing a construction program of $2,500,000,000 in the United States, and that the gas industry plans to spend $3,000,000,000 in the next four years. "Today we have 24 billion barrels of crude-oil reserves on hand and 176 trillion cubic feet of natural gas", the General added, "and we are currently producing in the United States 5,363,000 barrels of oil per day from 22 oil-producing states."

Awards

Emphasizing its continuous campaign for safety in the construction industry, the AGC presented seven awards and numerous certificates to member firms

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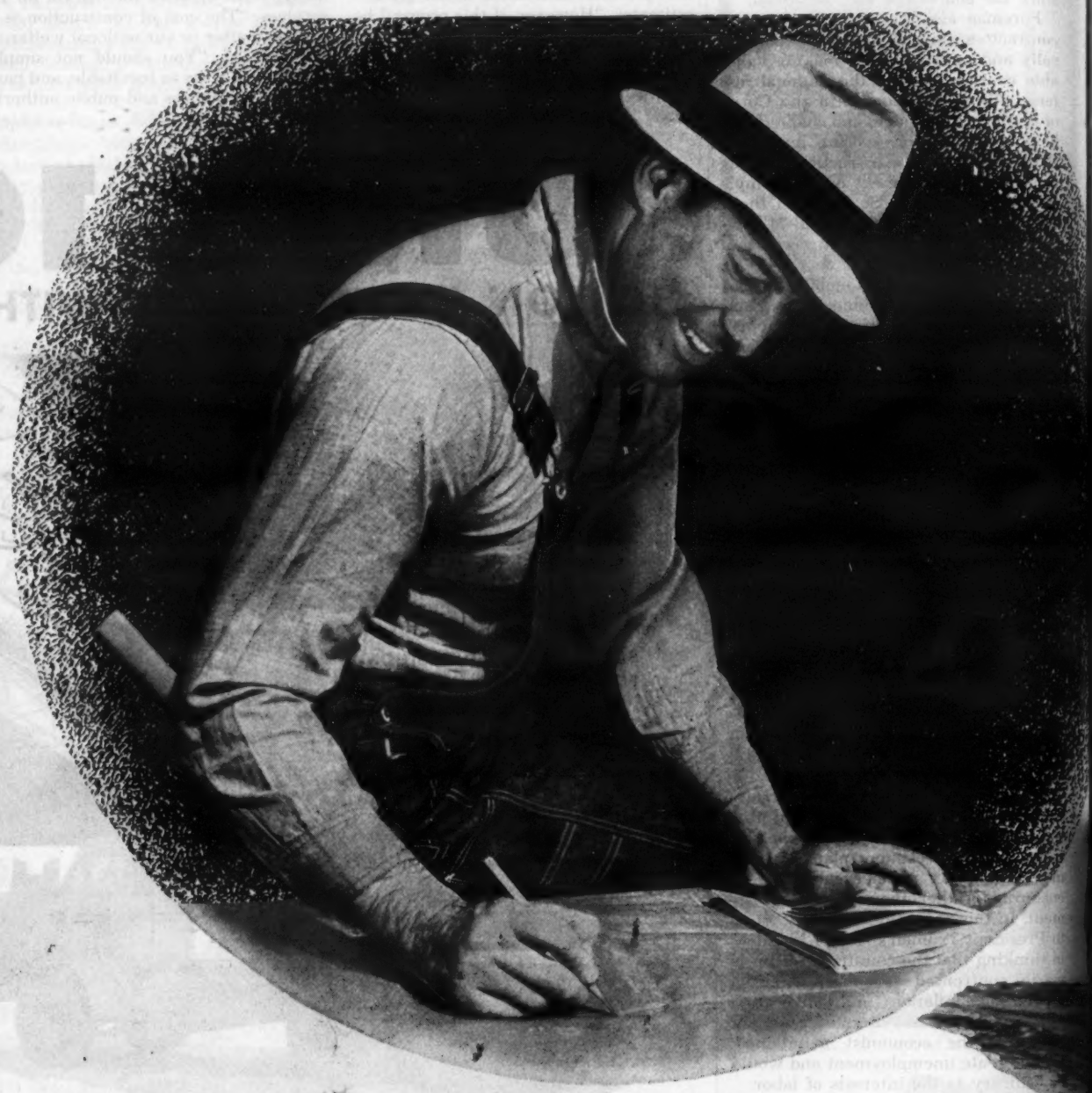

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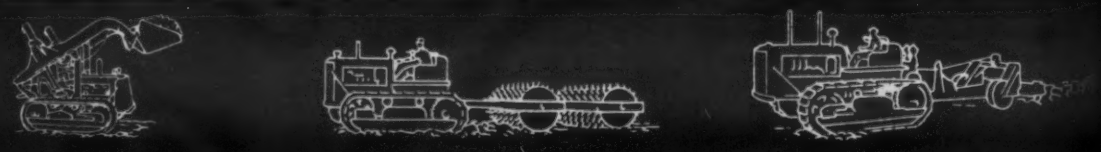

in its annual accident-prevention contest. Two companies in each of the AGC's industrial divisions — building, highway, and heavy — received prizes. In addition, a special prize for the best record in the New England Division was again won by its donor, the E. J. Cross Co. of Worcester, Mass.

The E. J. Cross Co. also won a prize in the building division, along with Thomas H. Bentley & Son, Inc., of Milwaukee, Wis. In the highway division the winners were the Burrell Construction & Supply Co. of New Kensington, Pa., and the Thorpe Construction Co. of Akron, Ohio. Heavy-division winners were the Holmes Construction Co. of Wooster, Ohio, and the C. F. Lytle & Amis Construction Co. of Cambridge, Nebr.

Mervyn G. Gaskin, President of Taylor & Gaskin, Detroit, Mich., building contractor, emphasized to the contractors the fact that the construction industry has consistently had a high injury record. He urged a planned safety program incorporating the three E's—education, engineering, and enforcement—followed by a thorough training, with sustained follow-up, to be carried on by all sections of the construction industry. Gaskin stated that in 1947 the construction industry was 34th out of 40 industries in severity rating. The severity rate is the number of days lost per 1,000 man-hours of exposure, including charges for permanent disabilities and deaths.

The Cashman trophy, a large silver cup, was awarded to the Carolina branch of the AGC. It is presented to the chapter which gains the greatest number of new members, at the same time maintaining its current membership.

The Constructiondising Award, a check for $100 and a certificate, went to Robert J. Hendershott, Manager of the Minnesota chapter which is headed by George Heller, President. The award is given for an outstanding plan of procedure for promoting construction in the best and timeliest way, including the training of apprentices.

Detailed reports were also submitted to each of the three AGC divisions by members of the association staff. W. A. Snow presented a staff report to the building-contractors' division meeting; A. N. Carter to the highway-contractors' group; and J. D. Marshall to the heavy-construction and railroad-contractors' assemblage.

Resolutions

Among the resolutions adopted by the AGC in the closing general convention session was one terming renegotiation of defense-construction contracts unnecessary in peacetime. Another resolution recommended that a committee be formed by the AGC and the building and construction-trades department of the American Federation of Labor to define the amount and type of work which craftsmen can undertake on the job without prejudicing the jurisdictional rights of other crafts. The association also recommended that the current limitations on day-labor operations by the Bureau of Reclamation be continued, and reaffirmed its opposition to authorities patterned after the Tennessee Valley Authority as "forms of government established contrary to the principles of free competitive enterprise".

Another resolution urged the amendment or clarification of existing laws to permit materials affected by the Supreme Court's basing-point decision to be priced competitively in any area. Federal loans to state and local governmental agencies were recommended for defraying the costs of preparing plans and specifications for the future construction, by the contract method, of essential public-works projects. The AGC warned against the passage of a national labor-relations act that might set aside existing state legislation banning agreements that make union membership a condition of employment. The association also recommended that the rights of states to enact labor legislation be not infringed upon.

AGC Directors

Besides President Adolph Teichert, Jr., and Vice President Walter L. Couse, other AGC officers include the newly elected directors: J. W. Brennan, Brennan & Cahoon, Inc., Pocatello, Idaho; J. G. Bartholomew, J. G. Bartholomew Co., Dallas, Texas; Chester W. Cunningham, Condon - Cunningham Co., Omaha, Nebr.; Cecil D. Bartholow, W. E. Bartholow & Son Construction Co., Huron, S. Dak.; Walter H. Ericsson, Henry Ericsson Co., Chicago; Fred I. Rowe, W. L. Johnson Construction Co., Columbus, Ohio; Max C. Harrison, Harrison Construction Co., Pittsburgh, Pa.; and Albert D. Blakeslee, C. W. Blakeslee & Sons, Inc., New Haven, Conn.

Re-elected directors were Charles L. Harney, Chas. L. Harney, Inc., San Francisco; Edward O. Earl, San Xavier Rock & Sand Co., Tucson, Ariz.; Carl E. Nelson, Carl E. Nelson Co., Logan, Utah; W. D. Amis, Amis Construction Co., Oklahoma City; George C. Koss, Koss Construction Co., Des Moines, Iowa; Charles A. Long, Sullivan, Long & Hagerty, Birmingham, Ala.; F. L. Shackelford, Potter & Shackelford, Inc., Greenville, S. C.; R. P. Bayard, Johnson, Drake & Piper, Inc., New York City; S. L. Fuller, John F. Casey Co., Pittsburgh; and Hal C. Dyer, Dallas, Texas.

Sales Manager for Heil

Henry Giles is now Sales Manager of the Road Machinery Division of The Heil Co., with headquarters at Milwaukee. He succeeds Dan Pierce, who has resigned to become Sales Manager for State Equipment Co., Heil road machinery distributor at Harrisburg, Pa.

Seattle Steel Sales Office

A sales office has been opened in Seattle, Wash., by the Consolidated Western Steel Corp., a United States Steel subsidiary. Located in the Exchange Bldg., it is under the directorship of Hanford Haynes and will serve the Pacific northwest area.

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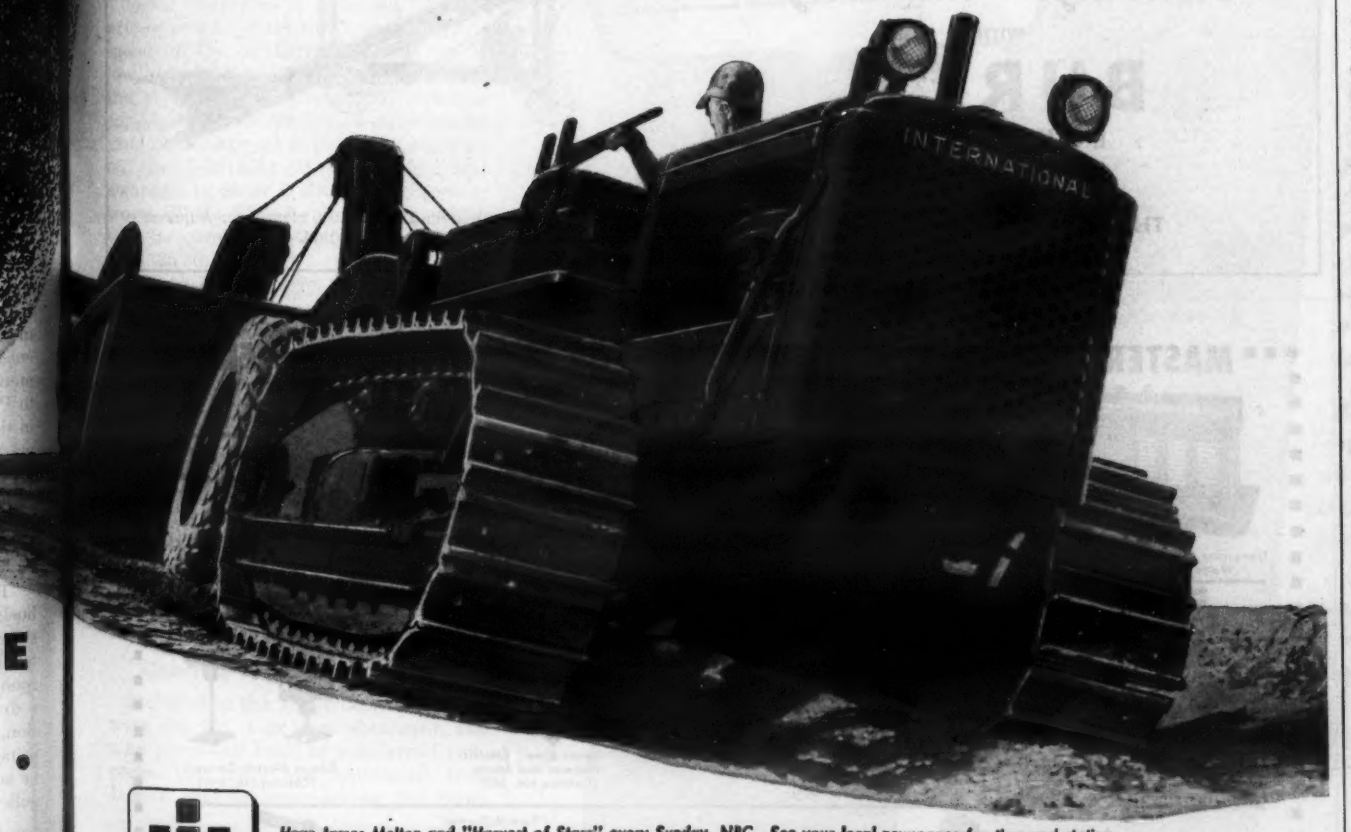

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Industrial Power

A push-squeeze handle develops pressures over 7,500 pounds on the E-Z one-hand-operated lubricator.

Lubricating Device Is One-Hand-Operated

A one-hand-operated lubricating device is announced by the K-P Mfg. Co., 1226 Linden Ave., Minneapolis 3, Minn. The E-Z greaser is designed for operation without air or electrical connections. A special push-squeeze handle enables the operator to develop pressures over 7,500 pounds, the company points out.

The E-Z unit is equipped with an open well to hold the grease gun when it is not in operation and prevent the nozzle fitting from clogging. It fits standard 25 to 40-pound containers and requires no tools for installation; three set screws do the job. The greaser is also equipped with 10 feet of hose so that hard-to-reach fittings can be serviced easily. A follower plate helps prevent channeling and pocketing of grease in cold temperatures.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 51.

A Curb and Gutter Paver

The self-powered Speedmaster for paving curbs and gutters is described in a bulletin prepared by Dotmar Industries, Inc., 503 Hanselman Bldg., Kalamazoo, Mich. Bulletin No. 48 covers both the Model S-24 and the Model S-30 Speedmaster pavers, which are designed to operate at speeds of 5 linear fpm and to pave curbs and gutters in one continuous operation.

The catalog emphasizes the five types of cross-sections which the paver lays: a curb and gutter of conventional shape, roll-over or lip curb and gutter, highway-dividing curb, highway run-off gutter, and others. It also contains several photographs of the machine in operation.

Specifications listed in Bulletin No. 48 cover the gasoline-engine power unit; the trowel, screed, and strike-off; overall length, width, and height; and approximate weight. These specifications are listed for both models.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 24.

Jacks in Several Styles

Jacks for all types of uses are described in an 8-page catalog prepared by The Joyce-Cridland Co., 2027 E. First St., Dayton 3, Ohio. They range in capacity from 1½ to 100 tons, and are designed for lifting, raising, pulling, supporting, and other jack uses.

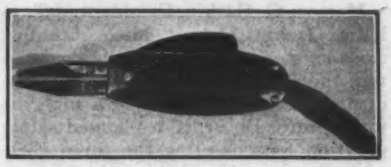
Each type of jack in the Joyce-Cridland line is illustrated in Bulletin 302. Along with the photograph, there is a description of the jack's principal features and the advantages claimed for it by the manufacturer. The data presented for each jack include its model number, capacity, height, degree of lift, weight, and price. The Joyce Liftmaster hydraulic jack is described in detail. This is made in six models having a capacity range of from 3 to 30 tons.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 57.

Soldering Iron Has Jaws to Hold Work

A soldering tool designed to grip the item being worked on is available from The Housing Foundation, Inc., Deep River, Conn. The tool resembles a pair of long-nosed pliers. Pressure on an actuating lever enables the operator to hold the work securely. Additional pressure starts the current flowing, generating heat at the point of contact.

The hand grip and actuating lever are made of electrically non-conducting plastic; the fixed and movable electrodes are made of a special carbon. A high-speed snap switch, mounted inside the hand grip and operated by the actuating lever, controls the flow of current



What looks like a pair of long-nosed pliers is actually the Triton Pres-to-Heat soldering iron, which grips the item it is working on.

when the tool is in use. The Triton Pres-to-Heat iron is designed for operation on a 110-volt 60-cycle ac supply. It draws a maximum of 250 watts. Special power units are available for use with other currents. Temperature of the work is controlled by varying the pressure on the actuating lever, the manufacturer explains. The grips can be used to hold the work until the solder sets.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 13.

Bulletin on Tractors

Features of the new Ferguson tractors are treated in a catalog issued by Harry Ferguson, Inc., 3639 E. Milwaukee Ave., Detroit 11, Mich. This folder, G-3353, shows side views of the tractor indicating the location of the various parts, and a top view indicating the location of the transmission, clutch pedal, brake pedal, starter, etc. It also describes in detail the Continental gasoline-engine power unit, the pistons, wet-sleeve cylinders, and drop-forged crankshaft.

The folder emphasizes five operational features claimed for the Ferguson, and contains a complete page of specifications covering engine, power ratings, speeds, power take-off, dimensions, battery, lubrication system, fuel system, carburetor, air cleaner, and other details.

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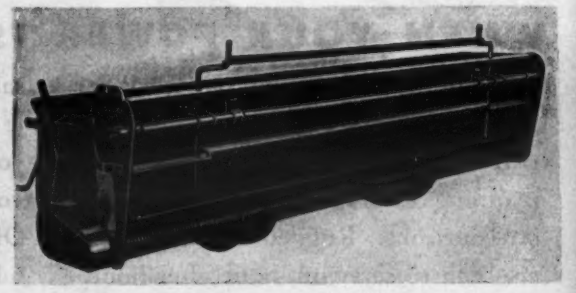

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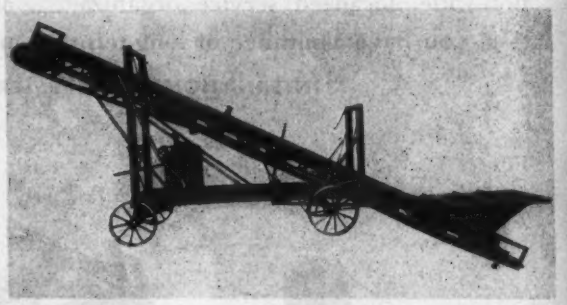

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New Bridge to Remove City-Traffic Bottleneck

Concrete Substructure Is Built Across Monongahela River North of Morgantown In West Virginia

✦ THE substructure for a new bridge across the Monongahela River in the northern part of West Virginia was completed last autumn. It marked a major step in the elimination of a serious traffic bottleneck in the city of Morgantown.

The new bridge measures 978 feet 8¼ inches between centers of abutments. It is about 2 miles north of downtown Morgantown, which is located on the east or right bank of the river. From this point the Monongahela flows northward through Pennsylvania until it reaches Pittsburgh, where it joins with the Allegheny to form the mighty Ohio River.

Actually the east abutment of the new bridge is in Star City, a suburb north of Morgantown. The present bridge across the river feeds heavy traffic directly into the narrow, hilly streets of downtown Morgantown. Much of this vehicular movement is through traffic which would by-pass the city if it could. The new bridge, with future connecting approaches, will provide such a by-pass. It will also permit easy interchange between U. S. 119 on the east side of the river and U. S. 19 on the west side, without the necessity of using the tortuous streets of Morgantown. The downtown bridge will remain; at present it is the only span for 28 miles along the river between Fairmont, W. Va., and Point Marion, Pa.

The State Road Commission of West Virginia awarded a contract for the bridge substructure to Ferguson & Edmondson Co. of Pittsburgh, Pa., on its low bid of $232,124.60. Work started on the structures in May, 1948, and was completed in November. A contract for grading the approach from Morgantown on the east side of the bridge was awarded to Boso & Ritchie of Ravenswood, W. Va. This 2-mile section, which will be completed this year, will cost $456,125.50.

Future contracts in connection with the project will include the structural-steel superstructure and concrete deck for the bridge; an easterly approach connection to U. S. 119; and a westerly approach connection to U. S. 19, including a 3-span bridge across Scotts Run. The last contract will also include the construction of the west or No. 2 abutment of the main bridge. This was left out of the bridge substructure contract as it could not be built until the cut was made on the west or left bank of the river for that approach between Scotts Run Bridge and the main bridge.

Concrete Piers and Abutment

Included in the substructure contract were the No. 1 or east abutment, and nine piers—all built of reinforced concrete. The piers are numbered from 1 to 9 east to west across the river. The span lengths center to center of bearings beginning at abutment are as follows: 51½, 75, 51½, 51½, 75, 51½, 411⅓, 68½, 66¼, and 68½ feet. A single-line track of the Baltimore & Ohio Railroad runs between piers 1 and 2. The longest span of 411⅓ feet, between piers 6 and 7, is across the river. U. S. 19 goes between piers 8 and 9 along the west bank, running parallel to the Monongahela railroad which passes between pier 9 and abutment 2.

The wide variety in individual span lengths is accompanied by great differences in the design of the piers themselves. Only the river piers, No. 6 and No. 7, are symmetrical. No. 1 abutment and piers 3, 4, and 5 are supported on bearing piles, while the remaining piers 1, 2, 6, 7, 8, and 9 are founded on rock.

C. & E. M. Photo
On the east bank of the Monongahela River, we see the cap pour on pier 1 in progress for the new bridge north of Morgantown. In the foreground is a track of the B. & O. R.R.

Piers 6, 7, and 9 have single, straight footings, while the other piers have dual footings. Rising out of the footings on the land piers are two stem columns which are connected at the top by a rectangular cap. Stem dimensions, together with their batter, and cap sizes, vary from pier to pier.

Tallest of the structures are river

(Continued on next page)

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New Bridge to Remove City-Traffic Bottleneck

(*Continued from preceding page*)

piers 6 and 7 which rise 65 feet from the top of footing to the top of cap. The footing of pier 6 is 47 feet long x 14 feet 6 inches wide x 10 feet 2 inches deep. The footing of pier 7 has the same length and width but is 12 feet 9 inches deep. The bottom of footings is at elevation 770. The footings each support two barrel stems with 12½-foot-diameter barrels at the bottom, and 7½-foot-diameter barrels at the top that are battered 1 on 24. They are connected by a web wall 4 feet thick at the bottom, 3 feet thick at the top, and battered 1 on 96.

Steel Bearing Piles

Steel bearing piles support abutment No. 1 and piers, 3, 4, and 5. Abutment 1 sits up on the approach fill on piles that were driven through the embankment after the fill was made. All piles were driven to a minimum bearing capacity of 30 tons. The steel was supplied by the Carnegie Steel Co. of Pittsburgh, shipped to Star City on the B. & O. railroad, and hauled from the rail siding to the job by trailer truck. The piles are 10-inch HBP 42-pound sections, 20 to 30 feet long. They were driven by a McKiernan-Terry 9B3 hammer moving in 45-foot steel leads which were handled by a Lorain crane with an 80-foot boom. Steam for the hammer was furnished by a vertical coal-burning boiler.

Each of the two footings in pier 3 has 9 piles; pier 4 has 14; and pier 5 has 16. Average spacing is 3½ feet on centers both ways, with piles cut off so as to project 2 feet into the concrete. They were capped with 12 x 1 x 12-inch steel plates.

For the piers which go down to rock, excavation was handled by a Michigan TLDT-20 truck crane equipped with an Owen ½-yard clamshell bucket. The overburden consisted of clay, sand, gravel, shale, and some boulders. To provide a key, 6 inches of rock was removed with a Gardner-Denver paving breaker powered by a Jaeger 210-cfm air compressor.

Sheet-Pile Cofferdams

The biggest and most important phase of the entire bridge project was construction of the two river piers, No. 6 and No. 7. They are located offshore about 25 to 30 feet, in 9 feet of water. Dirt ramps were built out to them to provide a working base or platform for the equipment that drove the piles, erected the forms, and placed the concrete. The piers were built within sheet-pile cofferdams, M116 sections 32 feet long, driven to rock at elevation 772.0 with the 9B3 hammer and the Lorain crane. The cofferdams measured 51 feet 3 inches x 19 feet 3 inches and had 38 separate sheet sections on the sides and 14 at the ends.

Inside the cofferdam, two 12-inch 60-pound H-beams were driven on each side with projecting arms welded to them to support the frame bracing. As the cofferdam was excavated with an Owen 1-yard clamshell from the crane, the three frame rings were lowered to the desired depth, having been secured to the top of the sheeting with cables. Dirt from the hole was cast on the river side of the cofferdam to counterbalance the weight of the ramp on the land side.

The rings were constructed of 12-inch 60-pound H-beams, and were given additional vertical support by posts. Cross bracing consisted of four 12-inch steel beam struts on 10-foot centers at each of the three levels. From top to bottom the three rings were placed at elevations 775.5, 783.5, and 794.0, with the top of the sheeting at 804.0. Pool elevation of the river is 793.0. The steel rings were assembled on the job and welded together with a Hobart electric welder.

C. & E. M. Photo

Concrete from an Insley 1½-yard bucket, swung by a Lorain crane, is discharged to a cap form on Ferguson & Edmondson's contract.

Form Work

The steel sheeting made a tight cofferdam. During the excavation the water was pumped out by two CMC 6-inch pumps, but as the bottom was reached only one was necessary. Finally, when the excavation was completed, only one CMC 4-inch pump was required to keep the interior dry. After a day's work of excavating, the usual practice was to let the cofferdam fill up with water at night and then pump it out again the next morning. From 2 to 3 feet of gray shale rock was removed from the bottom of the cofferdam to make a good bond with the concrete. The shale broke up readily under the paving breakers, and no blasting was required. The 210-cfm compressor supplied air for four breakers, using the steam boiler for a receiving tank.

Up on shore the forms were built on

(*Continued on next page*)

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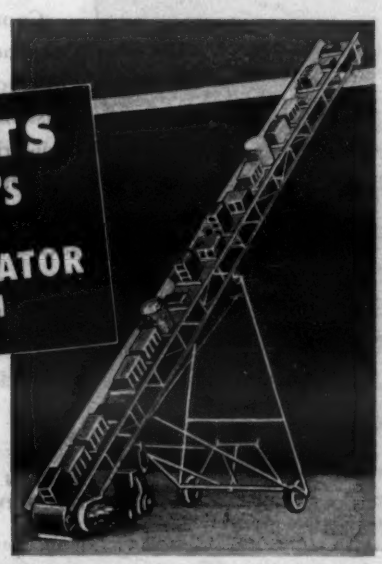

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BUFFALO SPRINGFIELD

C. & E. M. Photo
Superintendent Archie MacDonell leans against wooden barrel forms for the new Monongahela River bridge.

wooden platforms adjoining a carpenters' lean-to, which was equipped with a Comet radial saw and a 20-inch band saw. They were sturdily built of 2 x 8 redwood backed with 2 x 8 studs on 16-inch centers and double 2 x 6 wales on 24-inch centers. Richmond Tyscrus held the panels together. The barrel forms for the river piers were constructed in one piece with 2 x 3's for the longitudinal members and yellow-pine 2 x 12's for the segments. There were nine segments to a ring, with the rings spaced 24 inches on centers. These curved forms were faced with ⅛-inch Masonite, while the straight sections had a ¼-inch thickness. No facing was put on the footing forms or unexposed work.

After the barrel forms were made up on the shore, they were cut in half lengthwise and erected by the crane. Pier 6 was poured first, then the half sections of forms were floated across the river to be used on pier 7. Reinforcing steel placed in the forms was supplied by the Electric Welding Co. of Canonsburg, Pa., and delivered to the job by truck. A submarine cable was run across the river from the east to the west side so that power would be available for running the vibrators, welders, etc., and for lighting. Power lines were tapped on the east side of the river and stepped down with transformers to 110 and 220-volt lines.

Concrete Operations

Ready-mixed concrete was used throughout the job. It was supplied by the McClain Sand Co. of Morgantown, W. Va., in up to eight 3-yard truck-mixers at a time for the larger pours. The haul from plant to job was 4 miles. On the land piers, the concrete was chuted directly into the footings through hoppers and elephant-trunk pipe. For the stems and 35-foot-long caps, the concrete was discharged into an Insley 1½-yard bucket which was swung over the forms by the Lorain crane with the 80-foot boom. The bucket was not necessarily filled to capacity on the smaller pours.

An interior false form was built and subdivided into plus or minus 10-foot transverse sections. These were heaped with Class A 6-bag concrete plus 10 per cent, to an elevation where the volume, when the sections were jerked out, flowed immediately to the rock walls and sealed them up to the start of the main footing form. The balance of the footing was Class B 5-bag concrete.

No seal pours were required in the river piers, as the concrete was placed dry. All the pier concrete was handled by the crane and bucket with hoppers and elephant-trunk pipe. As the concrete was placed it was vibrated with two electric Vibers and one gasoline-driven Mall vibrator. Piers 6 and 7 were poured in two lifts of about 30 feet each. One such pour, the largest on the job, contained 325 cubic yards of concrete and took 13 hours to complete.

Forms were kept on for at least 24 hours, except for the caps which were not removed for 14 days. Curing was done with burlap and water; hydrants in Star City were tapped for the water, since the river is polluted. Most of the concrete used on the project was Class A with a strength of 3,000 pounds to the square inch at 14 days. Universal cement from Universal, Pa., was used in the mix. The aggregate was supplied by the Ohio River Sand & Gravel Co. The No. 6 gravel passed the 1½-inch sieve. The weights of a typical 6-bag batch were as follows:

Cement	564 lbs.	
Sand	1,290 lbs.	
Gravel	1,860 lbs.	
Water, 36 gallons	300 lbs.	(includes moisture in aggregate)
Total	4,014 lbs.	

Quantities and Personnel

The superstructure will consist of two continuous units of I-beams on the east and one continuous unit on the west. The main span over the river will

(*Concluded on next page*)

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The Cummins Diesel in this Euclid Rear Dump is typical of all the Dick Construction Company Diesels powering equipment and A. E. Dick Construction Company jobs.

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CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

New Bridge to Remove City-Traffic Bottleneck

(*Continued from preceding page*)

be a through truss with a vertical clearance of 50 feet above the water. The bridge is designed for H15-S12 loading, and will have a two-lane roadway flanked by sidewalks.

The major items in the bridge contract include the following:

Dry excavation	897 cu. yds.
Wet excavation	1,045 cu. yds.
Rock excavation	218 cu. yds.
Steel bearing piles	2,004 lin. ft.
Concrete	2,743 cu. yds.
Reinforcing steel	188,797 lbs.

A force of 50 was employed on the project by Ferguson & Edmondson Co. under the supervision of Archie A. MacDonell, Superintendent. The structure was designed by R. P. Davis, consulting engineer of Morgantown, W. Va.

For the State Road Commission of West Virginia, D. H. MacCollom was Project Engineer. The Commission is headed by Ray Cavendish, Commissioner, with M. L. O'Neale, Chief Engineer. L. L. Jemison is Bridge Engineer and George W. McAlpin is State Construction Engineer.

Board-Prying Tool Speeds Form Removal

A board-prying tool is announced by The Maco Corp. of Huntington, Ind. The Bord-Pri is designed to remove boards and planks with little or no damage, and is operated by one man. It can be used in dismantling concrete forms, in house-wrecking operations, and in the removal of flooring, roofing, or siding.

The Bord-Pri features two flat face plates which press against the board to be removed; supporting lips which press against the brace or studding which holds the board in place, and which provide the wedge action to force the board loose; and a long handle to give leverage. The tool can be used by placing the face plates against either the outside or inside of the board, whichever is more convenient. The same leverage is possible by moving the arm up or down.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 36.

American-Marietta Elects

The American Marietta Co. has announced the results of its recent election. A. King McCord was elected to the Board, and all who previously served as Directors were re-elected. Mr. McCord is First Vice President of The Oliver Corp.

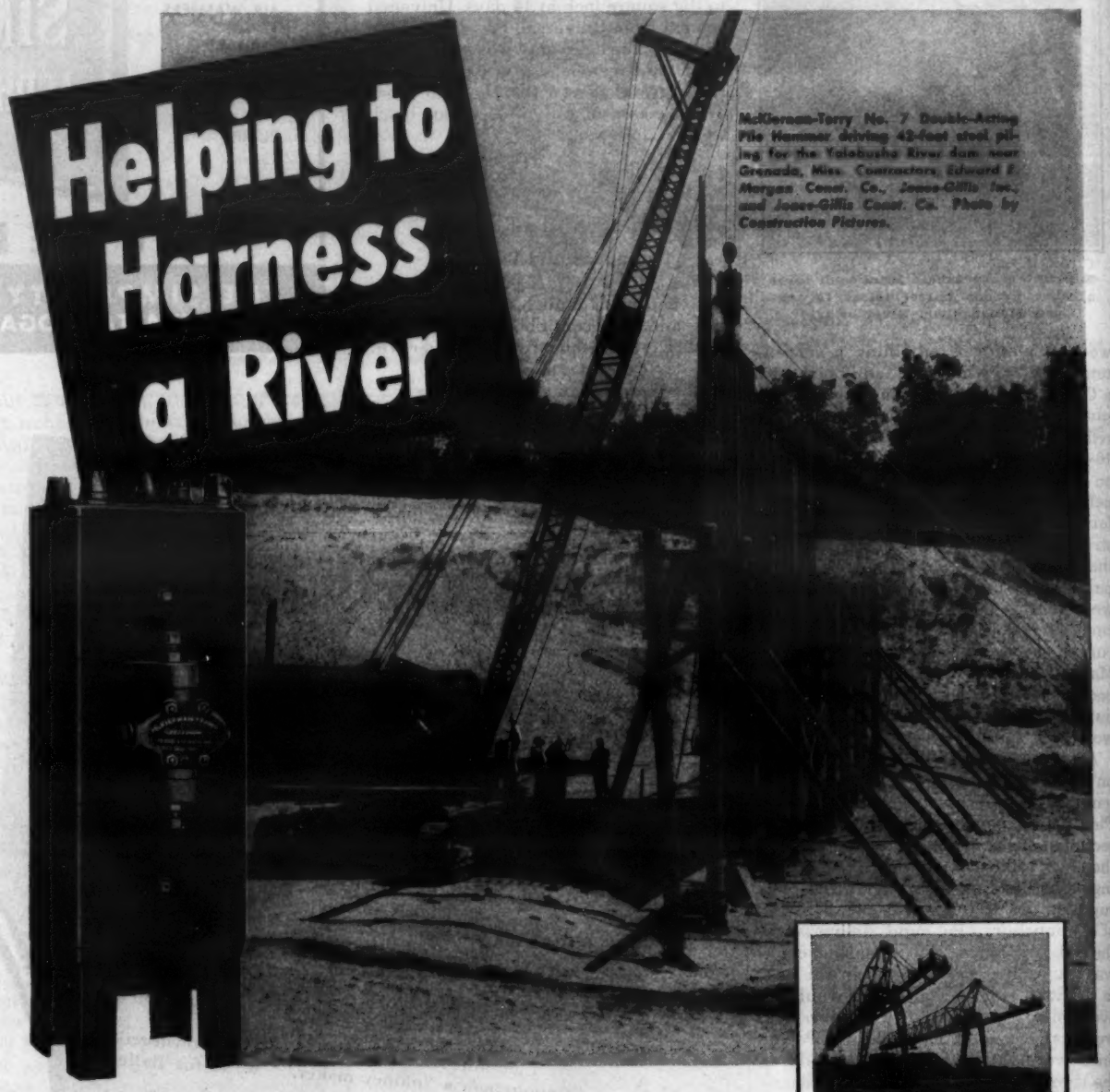
Data on Diesel Engines

A line of diesel engines for many applications is manufactured by R. H. Sheppard Co., Inc., Hanover, Pa. These engines are designed for use as separate power units or in combination with other equipment—diesel-driven welders, generators, pumps, etc. They are also recommended by Sheppard as power units for tractors, shovels, and other high-powered construction equipment.

A folder of catalog sheets describing the various power units and combination sets is now available from the company. These sheets provide pertinent information on each of the Sheppard diesels. Specifications listed cover bore and stroke; number of cylinder; gross, intermittent, and continuous horsepower; piston displacement; type of fuel used and capacity of the fuel tank; and type of starting system.

The Sheppard diesel-engine power units are made in a range of sizes from 3½ to 100 hp; the generating sets, from 2 to 75 kw; the diesel marine engines, from 3½ to 100 hp; and the arc welders, in 200, 300, and 400-amp models.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 121.



McKiernan-Terry No. 7 Double-Acting Pile Hammer driving 42-foot steel piling for the Yalobusha River dam near Grenada, Miss. Contractors, Edward E. Morgan Const. Co., Jones-Gillis Inc., and Jones-Gillis Const. Co. Photo by Construction Pictures.

The Grenada Dam, part of a wide flood control plan for the Yazoo River Basin, is an earth dam with a concrete spillway. A McKiernan-Terry Pile Hammer was chosen to drive the necessary steel piling . . . another tribute added to those being constantly paid by contractors to the dependability of McKiernan-Terry Pile-Driving Equipment.

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Concrete Work Spurs River Flood Control

Wide Concrete Channel Is Built Despite the Problems Of Water, Working Space, And Organization

(*Photo on page* 1)

✦ DESPITE bad ground-water conditions and cramped working space, another 12,200 feet of reinforced-concrete flood-control channel is about completed on the Los Angeles River. It will supplement other similar works built since 1935 between Hansen and Sepulveda Dams and the Pacific Ocean, and will protect the rich heartland of the city of Los Angeles from winter flood waters which formerly roared down the inadequate channel.

The latest job, at a contract cost of $3,400,000, was started April 1, 1948, and was pushed rapidly in order to get the concrete work finished ahead of winter rains. With January 10 set as the completion date for concrete work, most of it was in by December 1, and final completion was slated for April of this year. Bressi & Bevanda Constructors, Inc., of Los Angeles built this latest link of the system, which was designed and supervised by the Los Angeles Office of the Corps of Engineers.

Since 1935, flood protection for the Los Angeles area has been the joint responsibility of the Corps of Engineers and the Los Angeles County Flood Control District, and the two agencies have cooperated on much of the work.

Towards the west and northwest, the two main streams which have caused so much havoc in the past are the Los Angeles River and Tujunga Wash. Initial flood-protection steps consisted of the construction of Hansen Dam across Tujunga Wash near San Fernando, and Sepulveda Dam across the Los Angeles River near Van Nuys. This latest job is a continuation of the concrete and grouted-rock channels below these dams, which will carry flood water from the reservoirs safely to the sea.

The Bressi & Bevanda job extended from the Universal-International Pictures studio at Lankershim Boulevard west towards Tujunga Wash at its confluence with the Los Angeles River. It also included the confluence transition works, where the concrete channel becomes narrower as it goes on up towards the two dams.

Channel Design

From Lankershim Boulevard to the central branch of Tujunga Wash, the concrete channel is 130 feet wide; it is 120 feet wide from there to the west Tujunga Wash mouth. At that point the Tujunga Wash arm narrows down to 70 feet wide and the Los Angeles River arm is 60 feet wide.

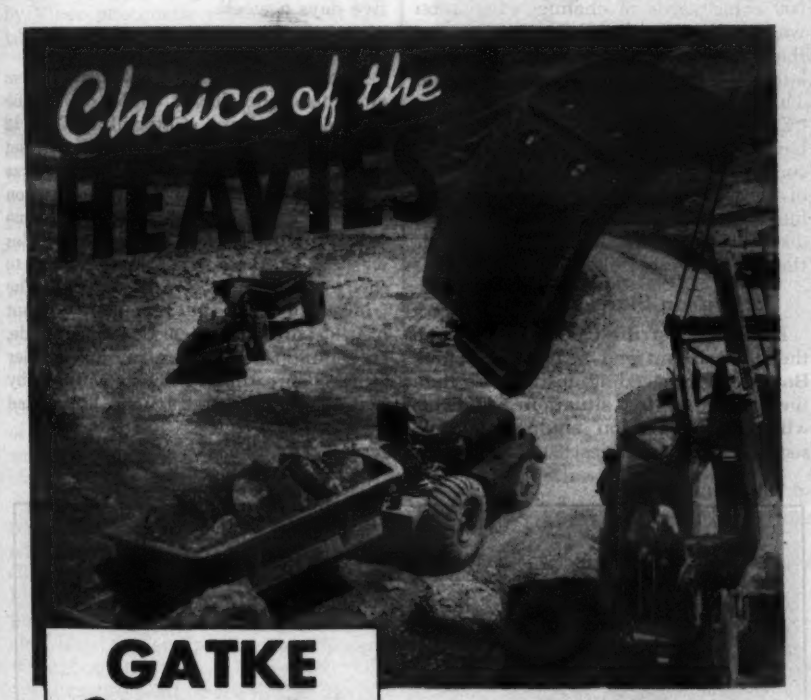
In the center of the main channel below Tujunga Wash, a low-water channel 12 feet wide was built. This low-water channel then narrows down to 6 feet wide and 3 feet 2 inches deep in both tributary arms.

In general, the reinforced-concrete

(*Continued on next page*)

C. & E. M. Photo

The C. & E. M. camera catches (left to right) Joe Muscolo, General Superintendent on the Los Angeles River channel job; J. K. Halloran, Assistant Project Manager; and J. G. Morgan, Resident Engineer for the Corps of Engineers.



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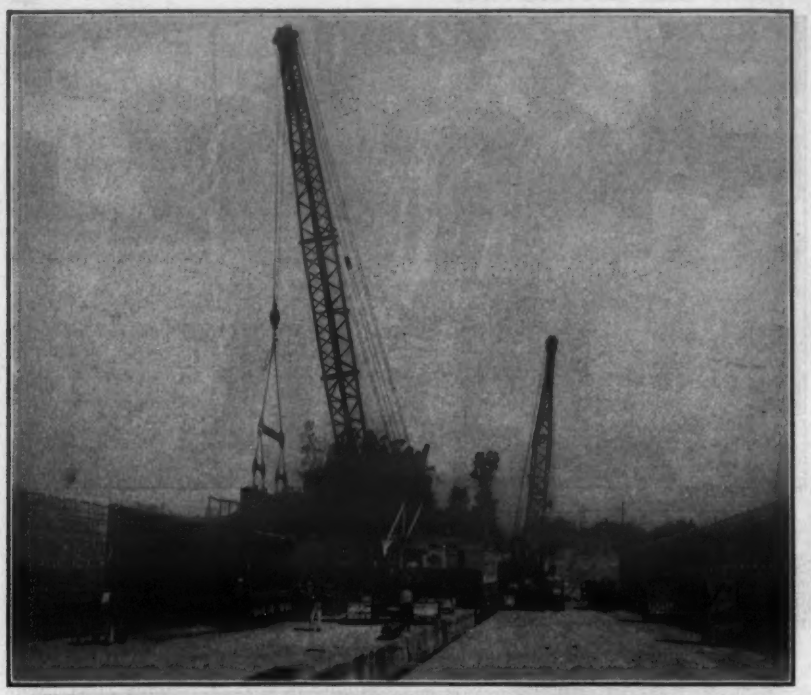
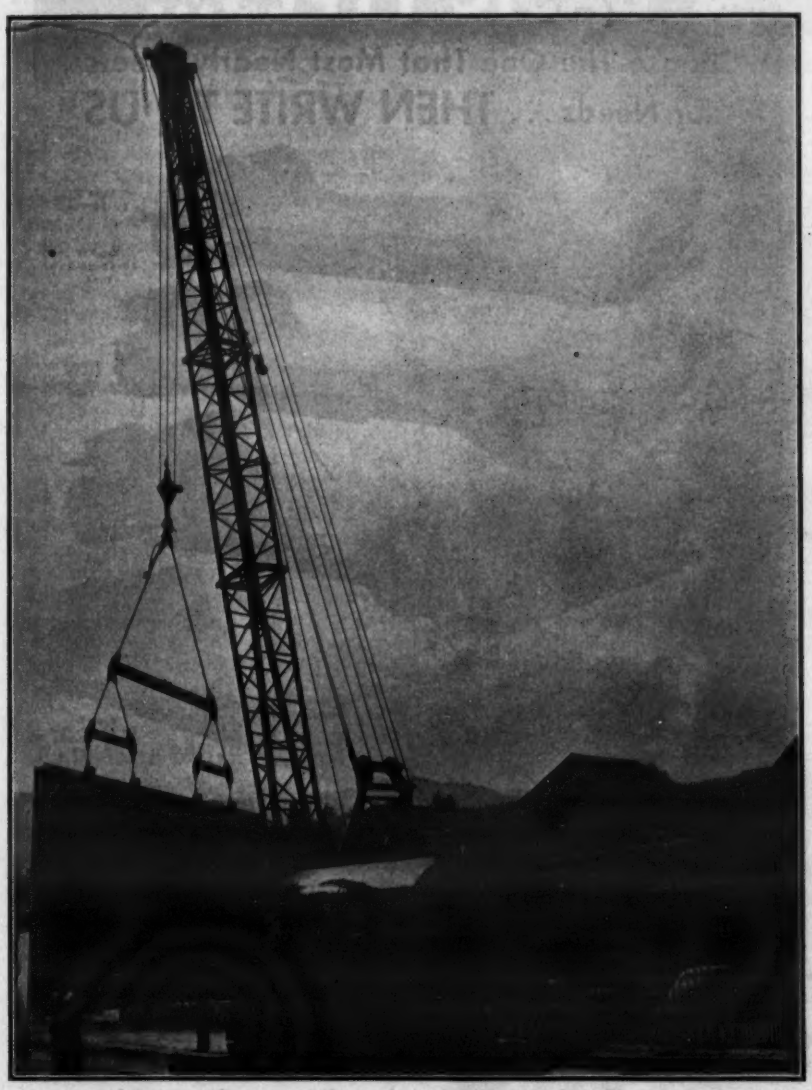


Bressi & Bevanda used a Lima 1201 machine to set heavy wall forms on the Los Angeles River flood-control channel which has just been extended another 12,200 feet.



The heavy steel wall forms were made up in 54-foot panels weighing 14 tons, which fit practically 85 per cent of the job. Pacific Iron & Steel Co. fabricated them.

Backfilling followed wall pouring, and water for processing the backfill was taken on by this tank truck from the low-water channel down the center of the main structure.

Concrete Work Spurs River Flood Control

(*Continued from preceding page*)

walls along the entire job are about 15 feet high, set on concrete footings 18 inches thick. Walls taper from a width of 16 inches at the base to 12 inches at the top, and a wire fence at the top of the wall serves to prevent children or bystanders from falling into the channel.

The low-water channel, which will carry the normal flow except during rainy periods, was designed for a capacity of 120 cubic feet per second. The main channel will carry 55,000 cfs below the central branch of Tujunga Wash, and the rest of the river-channel improvement works below have a Q-factor exceeding that.

The Bressi & Bevanda structure is surrounded entirely on the sides and bottom by open filter material. The form-bolt holes in the walls are left unplugged to add weep-hole capacity to the structure.

Filter material consists of 12 inches of sand up the sides of the walls next to the compacted-earth backfill. Under the invert it consists of 6 inches of sand, topped off with 6 inches of 3-inch-minus crushed-rock blanket. Thus the ground water which caused many a headache during construction of the project can now enter the channel freely.

The practical difficulties of carrying out the designer's wishes were multiplied as the channel narrowed down. First of all, ground water varied enough so that it was practically impossible to set up a rigid schedule, for water had to be taken care of when and where it developed. Second, approximately 805,000 cubic yards of channel excavation was perfectly planned for balance, so that every cubic yard would be re-used either as compacted or random backfill. This made it necessary to store huge quantities of dirt wherever possible, to handle some of it twice, and to cast some aside. Much of the channel right-of-way butted up against homes and business properties, so that here the disposal of dirt meant hauling it through the job to storage elsewhere.

Excavation Starts Downstream

Excavation of the channel started at the downstream end near Lankershim Boulevard, proceeding upstream so that the ground-water situation could be whipped. Excavation equipment consisted of two Northwest 80-D draglines operating in the river channel where material could be cast in one or two handlings. A Lima 1201 dragline with a 3-yard bucket and an 80-foot boom also dug and cast the earth, while a second Lima 1201 dragline loaded six rented custom-built 20-yard trucks. This machine worked in those restricted places where casting was impossible and material had to be hauled through the job.

Five Super C Tournapulls were also used, especially in one big cut where the new channel was all on new location. Here about 300,000 cubic yards of material had to be dug out and hauled 1,500 feet to a stockpile, to be used later on for backfill. Three Caterpillar D8's with LeTourneau Carryalls worked on some short-haul excavation, and there were eight other D8's on the job, equipped either as dozer, pusher, or sheepsfoot-roller machines.

Since much of the new channel was built over the old stream, it was customary to work a dragline from the top of each bank of the river, digging and casting from the center line out to the sides. The rough excavation for the low-water channel was made at the same time, and it was found to be unusually effective to dig an extra drainage ditch to one side of the low-water channel. Twenty centrifugal pumps of various makes then went to work and effectively dewatered the floor of the low-water channel so that concrete work could proceed. Water from the pumps was dumped farther down in the completed low-water channel as soon as it was built.

After the low-water channel was finished, the drainage ditch, which had served its dewatering purpose, was backfilled. Excavation work went forward on a basis of 8 hours per day, five days a week.

Building a Filter Bed

The initial excavation was left so close to grade that it could readily be finished off by a Caterpillar No. 12 motor grader working to blue-tops set by the survey party. A 6-inch course of sand filter material was put down on the fine grade. It was dug by a Lima 1201 dragline from a pit about 3 miles west, in Tujunga Wash, and hauled to the job by eight 8-yard trucks. The trucks dumped the material without passing directly over the fine grade, and bulldozers and a motor grader finished spreading it. It was watered by two 2,000-gallon tank trucks, and rolled by sheepsfoot rollers.

(*Continued on next page*)

C. & E. M. Photos

A layer of sand filter material was clammed behind the finished wall by this Byers truck crane at the same time that compacted-backfill work was in progress.

Six inches of crushed stone, 3-inch-minus in size, was placed next. This rock was furnished to the job from several plants of the Consolidated Rock Products Corp. It was dumped and spread in the same manner as the sand filter. Header boards were then set at the sides, and the crushed rock was dressed down by a Flynn highway subgrader widened somewhat to work the wider strips.

Low-Water Channel Is Built

Construction of the low-water channel had a great many "if's" to it: if the temporary ditch and the pumps were successful, there would be no trouble; if they were not, it would be something else again. In any case each pour presented its own problems and had to be dealt with individually, with particular reference to the water problem.

The slab of the low-water channel was poured first, followed by the walls. Wood forms were used. Concrete aggregate was dry-batched by Consolidated Rock Products from a batch plant set up at the center of the project. The batch plant included 1,500-barrel cement storage where the proper amount of low-alkali Riverside cement was added. This cement storage was supplied from a 500-barrel unloading plant silo at Bressi & Bevanda's permanent yard 6 miles away. The dry-batched concrete aggregates were hauled from the plant to the pour under a subcontract with Camillo Bros.

The batch trucks discharged their five 1¼-yard batches to a MultiFoote 34-E single-drum paver equipped with a short conveyor beyond the discharge lip of the single mixing drum. The concrete was spread from this contrivance with an elephant trunk, worked thoroughly around the steel reinforcement by Viber pneumatic vibrators, and finished off by steel trowels.

Main-Channel Construction

For the main channel, the footings, then the invert, and finally the walls were poured. The main footings were formed with wooden panels and poured by the same equipment and the same methods as were used on the low-water channel. The back of the footing, to be covered by backfill, was merely float-finished. This concrete, as well as all other concrete in the job, was cured by Hunt Process concrete-curing solution applied by spray.

For the invert work, 10-inch wood forms were used to outline one edge of the strip, and the previous concrete work of the footing and the low-water channel was also used.

Paving equipment for the slabs consisted of a Rex dual-drum 34-E paver, a Jaeger concrete spreader widened to 28½ feet, and a Jaeger-Lakewood finishing machine of the same width which put the initial mechanical finish on the slab. Batching equipment was the same throughout the job.

Expansion joints were placed at right angles to the channel axis every 100 feet, with extra dummy joints in the walls on 50-foot centers. The expansion joint carried through walls, slab, and footings. It was made up of 1-inch asphaltic mastic material fastened to the forms with nails in such a way that the forms could be easily removed.

All the curves in the channel were somewhat superelevated, but this caused very little trouble in constructing the invert. This work proceeded rapidly.

Construction of the high walls called for nine sets of special steel forms, which were used 50 times over without a failure. They were made up by Pacific Iron & Steel Co., using some steel panels owned by Bressi & Bevanda from a previous job. The forms were fabricated in 54-foot panels, which fit practically 85 per cent of the job. On shorter pours the steel forms were also used, but with formed bulkheads.

The back forms were not lined and had plain steel-plate faces. The inside channel wall forms were lined with 1-inch tongue-and-groove flooring bolted to the steel at close intervals. This wood work was so good that it lasted through the job with no attention other than occasional patching and sanding.

To hold the forms absolutely rigid during the pour, two rows of 15 she-bolts were provided. One row was placed about one-third of the way up; the other about two-thirds of the way up. The bolts were somewhat unusual, because they were designed to strip easily and leave a permanent hole

(Continued on next page)

C. & E. M. Photo

Steel workers on Bressi & Bevanda's river flood-control channel job set wall reinforcing steel from this portable wood frame. Steel was placed under subcontract by Anthony Meehlis of Los Angeles.

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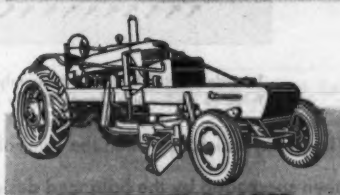

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Concrete Work Spurs River Flood Control

(*Continued from preceding page*)

through the concrete to add to its weeping capacity. Each 90-pound bolt was made of the highest-strength steel obtainable, and was tapered from 2½-inch to 1⅝-inch diameter.

The forms were set in place by a Lima 1201 machine. On long moves over 200 feet, the forms were laid down on a flat-bed dolly house-mover and hauled. Ordinarily they were used in such sequence that the big Lima crane could pick them up and walk the 14-ton weight to its next point of use.

Some excellent pouring records were established on wall bays. Pouring time averaged an hour for a 50-foot panel, and some of the pours were even reduced to 45 minutes.

Four Gar-Bro concrete hoppers on top of the forms carried the concrete through elephant trunks to the pouring level. One MultiFoote paver mixed the concrete and discharged it to a 2-yard transfer bucket. A Northwest 80-D crane picked the buckets up and swung them over the pour.

A crew of five men on top of the forms handled the concrete easily enough. Four men dumped concrete; the fifth operated a small pneumatic vibrator from the top. The main vibration was delivered by four Viber pneumatic external-type vibrators fastened to the inner wall form about one-third of the way up. These machines did an excellent job and the concrete on the inner face had very few air bubbles.

By using the big forms one day and moving them the next, as many as six pours were made in the 8-hour day. This included moving all equipment from one pour to another. In general, the invert and walls along one side of the channel were finished before moving over to the other side.

Backfilling and Landscaping

When the channel is finished this spring, it will be backfilled and fenced, and the earth work will be landscaped. A great deal of the backfilling was in progress long before all the concrete work was finished, in order to use all equipment to the best advantage.

Backfill material was hauled from stockpiles by the Super C Tournapulls, and dumped on the concrete channel floor where a Northwest 80-D dragline could transfer it behind the walls. Where there was room, the material was hauled right to the placement point and dumped. The dirt had to be put in

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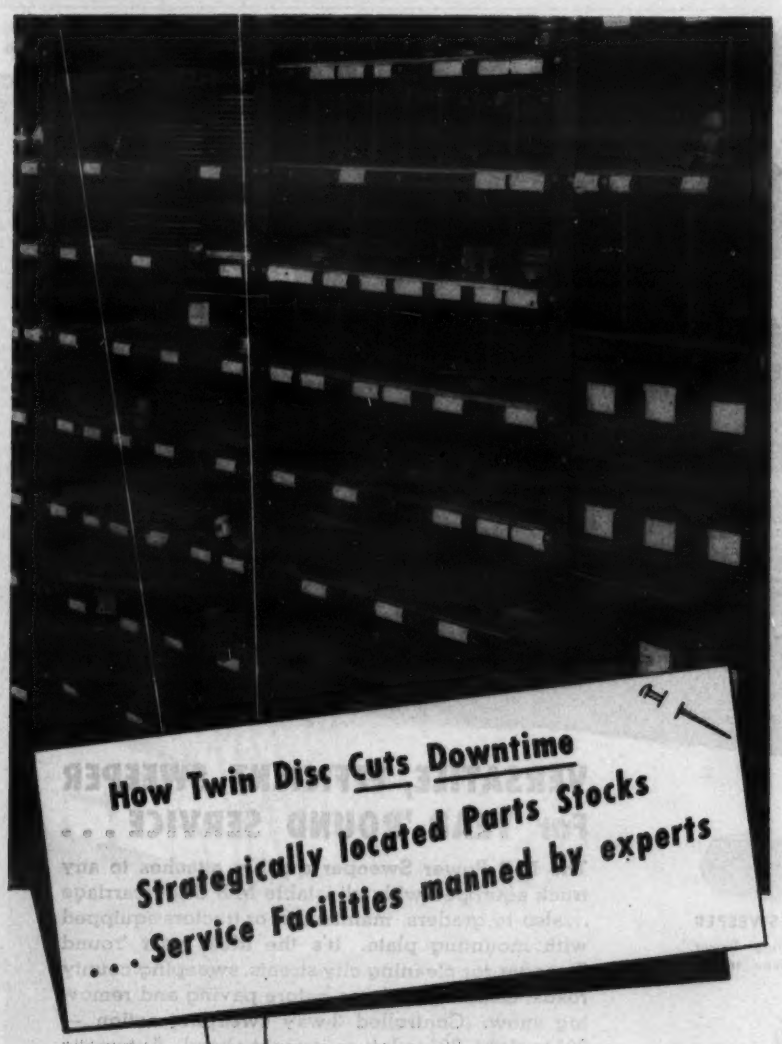

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RICE self-priming centrifugal pumps embody proven developments in pump design . . . features that set high standards in centrifugal pump performance:

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Write for New Illustrated Bulletin on 2", 7M and 10M models, the two most popular sizes of centrifugal pumps for the construction and oil field industries.

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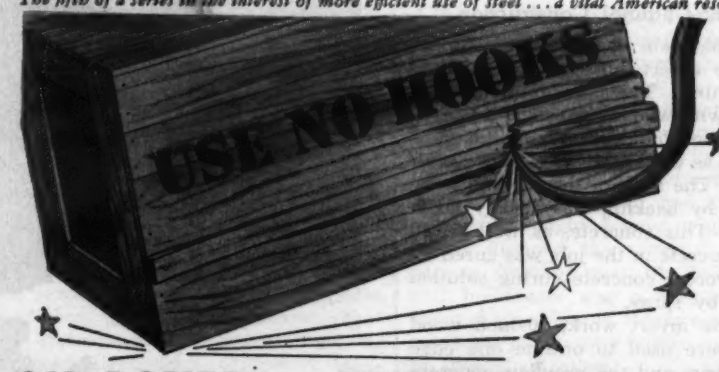

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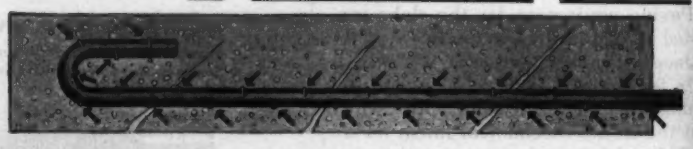
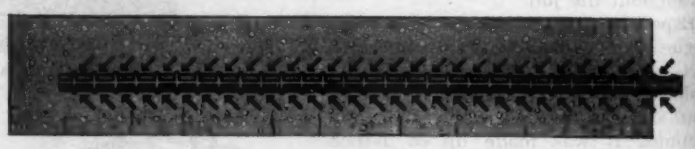


Old style reinforcing, with localized anchorage — conducive to widely spaced open cracks.



Laclede Multi-Rib Bars adequately transmit stresses to concrete by uniformly distributed anchorage. Small, closely spaced cracks do not open under load.

The hook, which has been the symbol of bond strength in 30 year old codes has been succeeded by the balanced design of reinforcing bar deformations specified in ASTM Specification A 305-47 T. The balanced design and distributed strength of Laclede Multi-Rib Reinforcing Bars meet these new requirements—assure a more efficient use of steel and a *better* job!

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Producers of Construction Steel
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in 6-inch compacted layers, watered if necessary, and sheepsfoot-rolled.

While this compacted-fill work was in progress, a layer of sand filter material at least 12 inches thick had to be constructed on the back of the wall against the concrete. The sand was hauled in, dumped in the channel, and piled by a small front-end scoop on a Minneapolis-Moline tractor. A Byers truck crane equipped with a ½-yard clamshell bucket picked up the filter material and dumped it behind the wall. Some sand was of course "lost" to the contractor, in order to insure at least a 12-inch thickness behind the walls.

Random backfill followed compacted backfill, and the finished job was dressed as smooth as motor graders could make it.

Improvement of the Los Angeles River channel is moving rapidly upstream now. One additional contract has since been awarded upstream from the Bressi & Bevanda job, and a few years more should see the concrete work extended to join with the dams.

Personnel

The job was designed and directed under the supervision of District Engineer Colonel A. T. W. Moore of the Corps of Engineers, with J. G. Morgan as Resident Engineer in charge of field construction. George Burrell was his assistant, and Lee Elmer was Chief Inspector.

Vincent Bressi, President of Bressi & Bevanda, acted as Project Manager, with J. K. Halloran as Assistant Project Manager. Joe Muscolo was General Superintendent and L. J. Wright was Job Engineer. E. S. Pulley was Office Manager, and "Si" Siler was the Master Mechanic who kept equipment running in good order for Bressi & Bevanda Constructors, Inc.

Fuel-Line Cleaner For Diesel Engines

A gum and sludge solvent for use with diesel fuel and heating oils is announced by the Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland 4, Ohio. This additive is said to keep the fuel lines and injection system clean at all times and to maintain a free flow of fuel to the engines.

The Diesel Gumout is available for use in all types of diesel equipment. It is added in a ratio of one pint of Gumout for every 50 to 100 gallons of fuel. It is packaged in 1-pint cans, 5-gallon pails, and 15, 30, and 55-gallon drums.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 88.

New Front-End Loader Matches Motor Grader

An improved front-end loader for mounting on motor graders or maintainers is announced by the Meili-Blumberg Corp., New Holstein, Wis. It is equipped with a standard ½-cubic-yard bucket and will handle dirt, sand, gravel, or other similar materials. A 1-yard bucket is available for handling lighter materials.

The M-B front-end loader has a clearance, when in the dumping position, of 8 feet 6 inches, to permit it to drop its load into all types of dump trucks. A single lever located at the operator's seat provides remote control of digging pitch, raising, leveling, dumping, shaking, and lowering.

The new Meili-Blumberg front-end loader has a clearance, when dumping, of 8 feet, 6 inches.

Operation of the loader is independent of the grader blade, scarifier, or leaning wheels. And since it is mounted on the grader, it can be used to pick up material windrowed by the grader. The loader is available as a separate unit for mounting on M-B graders and maintainers already in operation, or can be specified for installation on new units.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 72.

Road Taxes Hit New Record

Federal automotive excise taxes reached a new high of $1,179,865,000 in 1948, according to the National Highway Users Conference. These emergency taxes go into Government's general funds.

Payments of special state taxes hit a record of $1,836,000,000 in 1948. These payments by highway users increased at a much faster rate than the funds made available for highway use.

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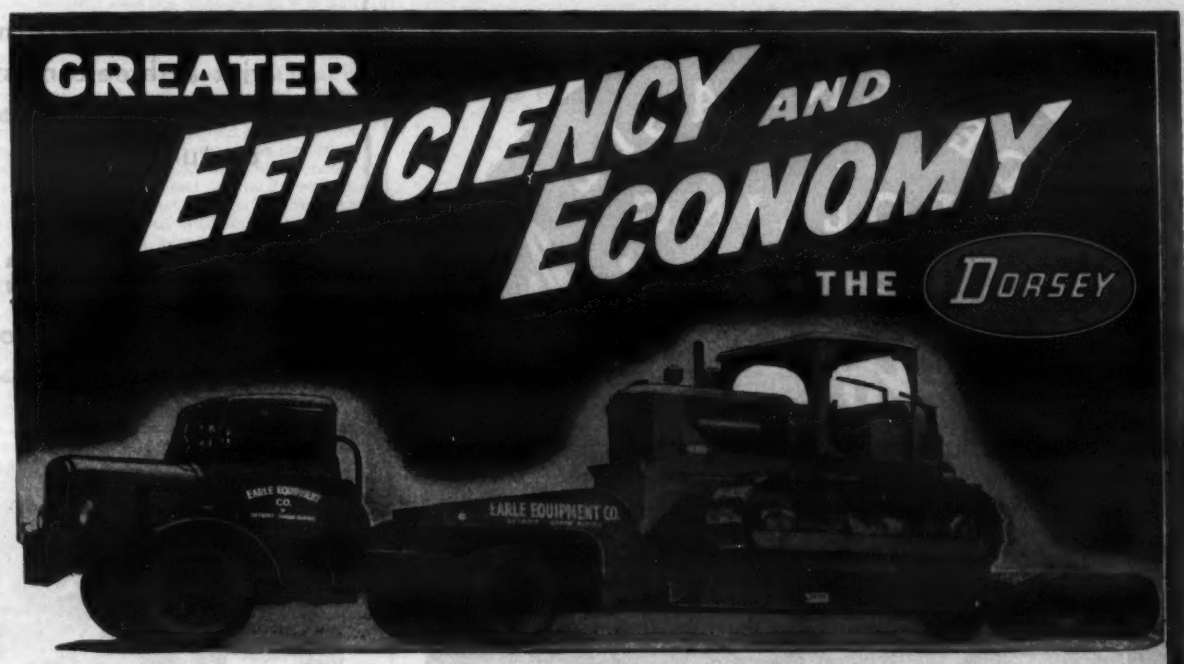

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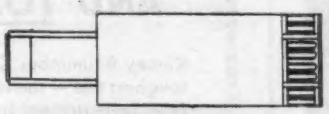
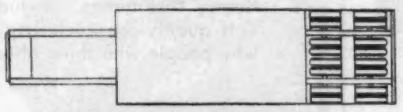
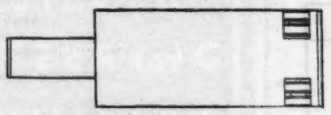


Model M 15-20-25 Tons



Model MT 35-40-50-60-75 Tons



Model MK 10-15 Tons

Contractors and Engineers throughout the nation are selecting the Dorsey Low Bed Heavy Duty Semi or Full Trailers to move heavy equipment . . . to "Make the Heavy Jobs Light."

Dorsey Low Beds are available in four models — M — MK — MTS and MT — with capacities from 10 T to 75 T — a model for every need and state law load limit.

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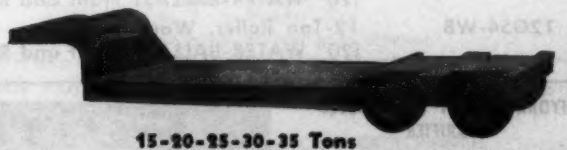

15-20-25-30-35 Tons

A-7 7,500 lb. A-15 15,000 lb. A-20 20,000 lb.

DORSEY TRAILERS
ELBA ALABAMA, U. S. A.

Sky Birds to Roost On Hot-Mix Paving

(*Continued from page 3*)

field 3-axle tandem roller and a Buffalo-Springfield 2-axle tandem machine are used on hot-mix. Because the weather is usually cool, they operate rather close to the laydown machine.

Specifications also call for a seal coat on top of the hot-mix. This will consist of from 0.15 to 0.30 gallon of emulsified asphalt per square yard, with from 7 to 10 pounds of ¼-inch-minus aggregate. This coat is expected to seal the surface against rainfall, thus keeping the subbase dry.

Ultimate development of San Francisco Airport will include additional paving and a huge new administration building. The latter is still in the "doubtful" stage because bonds for its construction were voted down at the last election. But the big airport is already truly international. United, Pan-American, American, TWA, Western, Southwest, Philippine National, and British Commonwealth Airways all operate scheduled flights from the field, and so do non-scheduled companies.

Personnel

B. M. Doolin is General Manager of the airport, and all project management is under the direction of A. J. Wehner, who is in charge of the engineering work.

Morrison-Knudsen's key men include Project Manager John L. Gregg, General Superintendent George Haensel, Master Mechanic Ray Blanchard, General Foreman Jack McGuire, and Engineer David S. Richards.

Pipe Tools of All Kinds

A 32-page catalog describing a complete line of pipe-cutting tools is available from Beaver Pipe Tools, 1948 Dana Ave., Warren, Ohio. The Beaver tools include threaders, square-end sawing vises, reamers, cutters, combination cutting-and-threading machines, and others. They are made in a wide variety of styles and sizes, and in hand-operated or power-driven models.

The catalog illustrates each item in the line, placing special emphasis on the construction and features. It includes specifications as to the size of pipe each tool will handle, its speed, attachments and accessories available for use with the basic unit, etc. And it describes the principal features of each tool as well as the method by which it operates.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 11.

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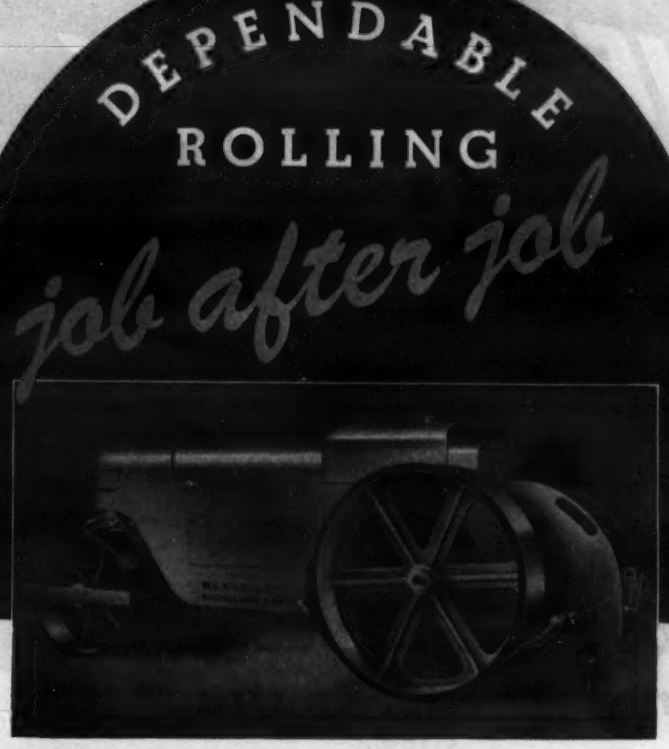

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10G54	10-Ton Roller, Waukesha Gas 54 HP
12D51	12-Ton Roller, Waukesha Diesel 51 HP
12G54	12-Ton Roller, Waukesha Gas 54 HP
12D51-WB	12-Ton Roller, Waukesha Diesel 51 HP (20" WATER-BALLAST Front and Rear Rolls)
12G54-WB	12-Ton Roller, Waukesha Gas 54 HP (20" WATER-BALLAST Front and Rear Rolls)

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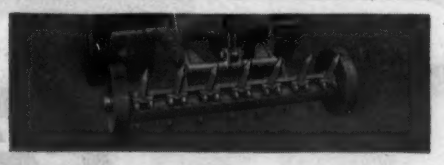

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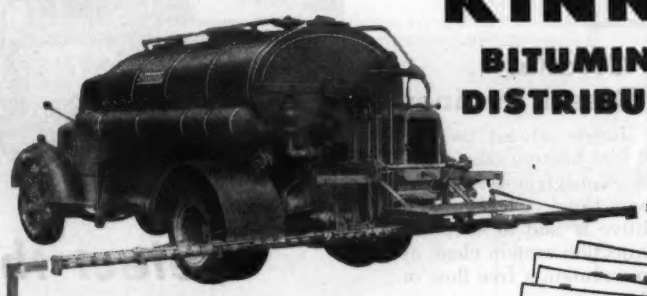

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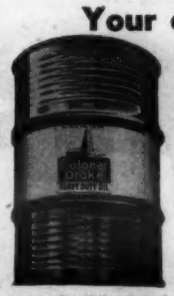

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Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Road Contractor's Duty To Erect Guardrails, Etc.

THE PROBLEM: *A contractor was constructing a vast Government plant, including roads. The roads, but not the overall project, had been completed. A car traveling one of these roads skidded over an embankment where the highway ended in a T-intersection with another highway. The accident happened at night and the motorist did not know, and there was nothing to warn him, that the highway ended at that point. Was the contractor liable?*

THE ANSWER: Yes, decided the Tennessee Court of Appeals, Western Section, Memphis. (Trigg v. H.K. Ferguson Co., 209 S. W. 2d 525.)

The decision will be of greatest interest to contractors who are building roads as incidental features of industrial and Government projects. But it also deserves study by contractors who limit their operations to road construction. The opinion of the court differentiates between the responsibility of the first class of contractors, as to highways, and that of a road contractor whose work has been accepted by the public authority without contractual obligation on his part to install safety features.

The accident occurred while the Wolf Creek Ordnance Plant was under construction near Milan, Tenn. The project covered 40 square miles and included 217 miles of paved roads.

The trial judge withdrew the motorist's suit against the contractor from a jury's consideration at the end of the trial, on the ground that the evidence conclusively showed that the contractor was not liable. But the Court of Appeals reversed the decision and ordered a new trial, ruling that a jury could have decided in plaintiff's favor.

The contractor treated his obligations as being the same as if the roads were constructed for a state highway department. He argued that because neither the contract nor the plans specified that warning devices or barricades were to be erected by the contractor, there was no responsibility in that regard. But the court reasoned otherwise. It was unlikely, it said, that in contracting for construction of an ordnance plant as a whole, the Government would award independent contracts to cover such minor features as marking the roads.

Said the court: "The situation was basically different from the ordinary construction of a highway for public use where the builder contracts with the state department of highways. It is common knowledge that in such a case the department itself maintains a force for the marking of highways. Here there is nothing to warrant the view that the Government or any of its agencies was prepared to or intended to put up any signs or barricades at any point within the area; or that it intended to make a separate . . . contract for the work."

The court said that this clause of the contract was elastic enough to require the contractor to erect barricades, etc.: "The work shall be executed in the best and most workmanlike manner . . . and in strict conformity with the best standard practices." (The court seems here to confuse the character of workmanship to be used, dealt with by the quoted clause, with the extent of work to be constructed, which does not seem to have been in mind in adopting that clause.) The opinion says: "If we are correct in assuming that . . . to perform their obligation to build a complete plant the defendants necessarily had to build a system of highways complete and ready for use, then . . . that obligation had not been fully performed at the time of the accident, because . . . the standard practice was to put an appropriately placed barricade and guardrails at an intersection such as that made."

The opinion cited a decision of the Iowa Supreme Court, to the effect that a contractor who leaves a highway in dangerous condition, failing to guard it properly and knowing it is open to traffic, is liable for resulting injury to one rightfully and carefully using the road.

The court noted that "the defendants' engineer testified that the intersection was dangerous without a guardrail or barricade, a fact that must have been obvious to any prudent road contractor."

Counsel for the contractor relied upon the well established rule of law that after a highway construction contract has been performed and the work accepted by the governmental body, the contractor owes no duty to the traveling public. And the court conceded that the acceptance need not be formal, but can be shown circumstantially. But the court said that this does not mean that a contractor can rid himself of responsibility by taking to himself the authority to open the road to traffic and declaring that his work is done.

Furthermore, the court said that this was not a highway construction contract within the meaning of the rule of law above stated. "The building of the roads, while a sizable undertaking in itself, was a mere incident to the larger obligation to construct a complete shell-loading plant." There was nothing to show that the work was to be accepted piecemeal, "a road here, a building there, and the like". In fact, the roads were still being mainly used by the contractor's own employees and persons doing business with the contractor.

In any event, it was for the jury to determine, as a fact, on the entire evidence in the case, whether the contractor's control over the road in question had terminated, and if not, whether the contractor had been negligent in failing to erect guardrails and warning signs at or near the intersection.

Government Overestimates Yardage on Levee Contract

THE PROBLEM: *The Government inaccurately estimated that a levee-rebuilding job would involve placing approximately 567,000 cubic yards of earth. It turned out that only 354,746 cubic yards were involved. Was the contractor entitled to reimbursement for excessive expense?*

THE ANSWER: Yes, decided the United States Court of Claims. (Chernus v. United States, 75 Fed. Supp. 1018.)

When bids were invited and the contract was awarded, the site was inundated by the floodwaters which had broken the levee. This prevented any independent investigation of the quantities of earth to be moved.

The contract was a unit-price contract, and specified that "discrepancies between the actual conditions encountered and those indicated on the drawings will not be considered as the basis of a claim for damages or increased unit costs of doing the work." But it also contained a clause providing for increase or decrease of cost caused by discovery that subsurface or latent conditions

(*Concluded on next page*)

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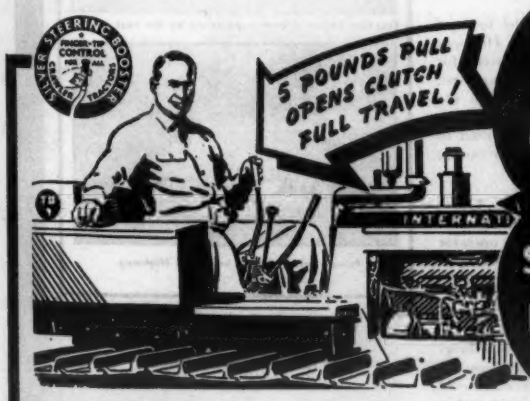

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Avoid Legal Pitfalls

(Continued from preceding page)

materially differed from those indicated in the specifications, etc., if approved by the Secretary of War or a person acting as his representative.

Relying on the estimated quantity of earth to be placed, the contractor arranged with other parties to provide machinery adequate for the work to be done within the time fixed by the contract. As the job actually developed, much of this equipment was not needed, and involved useless expense of $19,092.60.

The Court of Claims applied to the case what it had decided in an earlier case where a large underrun of work was involved: "We held that the petition stated a cause of action; that the parties in making their contract did not intend that the cautionary language of the specifications should turn the process of bidding on a Government contract into a pure speculation. We thought that such a literal interpretation of the contract, in a case where the parties were, obviously, laboring under a mutual mistake as to vital facts when they made it, would, in the particular case, be unfair to the victim of the interpretation, and, in the long run, ruinously costly to the Government."

Was Contractor Liable For Landowner's Arrest?

THE PROBLEM: *On the facts stated below, was a Government-levee contractor liable in damages because of the arrest of a landowner who obstructed progress of levee construction?*

THE ANSWER: No, according to the Oklahoma Supreme Court. (Garrett v. Jones, 200 Pac. 2d 402.)

Plaintiff landowner testified that defendant contractor's construction superintendent threatened to have her arrested and "thrown in jail" when she objected to construction of the levee on her land, and that she was later arrested and kept in jail for two days. But, in deciding that the contractor was not liable, the court found from the evidence that the arrest and imprisonment were really caused by the attorney for the drainage district, and that the warrant was issued only after the prosecuting attorney of the county had investigated the affair.

The court adds: "Assuming that defendant desired the arrest of the plaintiff as contended by plaintiff," there was no evidence "showing that defendant directly or indirectly . . . caused her to be imprisoned."

Contract Readjustment To Increased Labor Costs

THE PROBLEM: *A Government construction contract provided that if the Government's administrator should alter minimum wage rates, because of "fundamental changes in economic conditions", the contract price should be increased proportionately. Did this clause give the administrator uncontrolled discretion to grant or refuse an increase in the contract price?*

THE ANSWER: No, decided the United States Court of Claims. (Anthony P. Miller, Inc., v. United States, 77 Fed. Supp. 209.)

In this case the contractor successfully claimed that the administrator had, so to speak, ignored the "facts of life"—the scarcity of labor and the impossibility of securing any at the existing minimum rates fixed by the contract. The court said:

"The evidence indicates that the Government's agents interpreted the contract provision as placing in the Administrator an uncontrolled discretion as to whether he would increase the minimum rates and thus entitle the plaintiff and its subcontractors to reimbursement, or would not, thereby leaving them to pay the increased wages out of their own pockets. This would be a remarkable provision to write in a contract, and we do not so interpret the contract. We think it was the Administrator's contractual duty to consider the question; that, though requested, he refused to do so; that if he had done so, he would have concluded from the evidence that there had been a fundamental change in economic conditions within the meaning of the specifications, and would therefore have increased the minimum rates. The plaintiff and its subcontractors, by paying wages which became the prevailing wages in the area during the period of performance of the contract, expended $24,456.10 more than they would have expended in paying the minimum wages stated in the contract. We allow the plaintiff to recover this amount, most of which is recovered by it to the use of its subcontractors . . . See United States v. Blair, 321 U.S. 730, 737, 64 S.Ct. 820, 88 L.Ed. 1039."

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Model DJ
16" Cutting Width
ONLY $300

Hornet Chain Saws combine compactness and light weight with ease of operation and fast, powerful cutting. They save time, labor and money. Low initial cost and long, dependable, trouble-free operation. Ruggedly constructed to meet the toughest requirements. Open-end cutting lengths available in 16", 20", 24" and 30". For two-man operation in 24", 30" and 36". Easy to handle and easy to move (Model DJ weighs only about 30 lbs.). Before you buy get the Hornet story. Find out how you can apply this speedy, efficient chain saw to your cutting needs.

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= 8 MACHINES!

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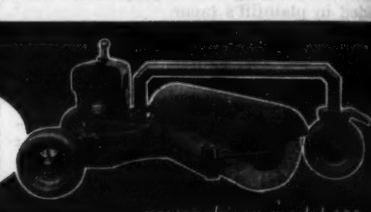

power driven model 108

HIGHWAY BROOMS

Traction Driven Broom Model 106

Traction Driven Broom is powered by the rear wheels.

Power Driven Broom sweeps a Highway.

LITTLEFORD Power Driven Model 108 and Traction Driven Model 106 Highway Brooms have the Hydraulic System for raising and lowering the Broom—and too, this hydraulic system saves wear on the broom, because the tension on the road surface can be regulated. There's no need to have the full weight of the broom resting on the road surface.

MONO-FRAME CONSTRUCTION of the Littleford Highway Brooms makes these units sturdy, yet light weight, gives the operator better vision of the broom, makes it easy to handle and shortens the turning radius.

TWO-WAY BROOMS—both Littleford Brooms can sweep in either direction and it takes only 30 seconds to change from one direction to the other. Both models can be equipped with Sprinkler System and model 108 Power Driven can be equipped with a Dust Blower Unit.

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BLACK TOP ROAD MAINTENANCE EQUIPMENT SINCE 1909
LITTLEFORD BROS., Inc.
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Operation Haylift: Bucking its way through 25 to 30-foot-high drifts to the isolated Arthur Grass ranch 7 miles north of Page, Nebr., this Allis-Chalmers HD-7 and its operator were the Grasses' first visitors in 3 months—welcome ones, too, for they permitted precious hay to be brought in for the 150 head of undernourished cattle.

Bucket Loader's Feature Is Swivel Belt Conveyor

Heavy-duty bucket loaders are described in a 12-page catalog now being distributed by the Pettibone-Mulliken Corp., 4700 W. Division St., Chicago 51, Ill. This catalog demonstrates with pictures the various applications of the Haiss loaders.

Loaders listed in Folder No. SBC-1048 include the Model 135 with a capacity of from 5 to 8 cubic yards per minute; the Model 80 with a capacity of from 3 to 5 cubic yards per minute; and the Model 75 with a capacity of 3 cubic yards per minute. All three models have an integral swivel belt-conveyor discharge. The Models 80 and 75 can be equipped with crawler or wheel mounting; the 135, with crawler only.

Specifications listed cover the rated capacity, weight, make and size of the gasoline-engine power unit, transmission, speeds, width and length of the crawler track, clean-up scraper blade, width and capacity of the elevator bucket, control of boom raising and lowering, and size of the swivel belt conveyor. In addition, a chart shows complete dimensions of all three of the models.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card at page 16. Circle No. 65.

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Cost records from job after job prove that Economy's system of Form Engineering and Rental Service means substantial savings in TIME — MATERIAL — MONEY for GREATER PROFITS.

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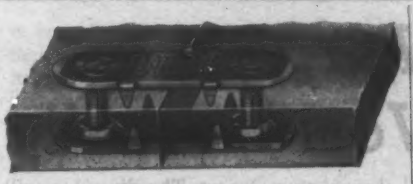
Rigid-Frame Buildings Serve Utility Purposes

Rigid-frame aluminum-covered steel buildings are described in a catalog issued by the Butler Mfg. Co., 7400 E. 13th St., Kansas City 3, Mo. They are available in a wide range of sizes and, with certain variations by the purchaser, can be used as warehouses, portable field offices, equipment maintenance sheds, garages, airplane hangars, and other temporary or permanent structures.

The Butler buildings come in three basic widths—20, 32, and 40 feet. The catalog describes each of these and illustrates the types of end-wall and side-wall panels which are available and which permit varying the location of doors and windows. The catalog includes several interior views of the Butler-built buildings, showing how they are constructed and the space available in them.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 35.



These Plategrip fasteners for heavy-duty conveyor belts are designed to withstand any load the belt can safely carry. They are made of heavy-gage steel.

All-Metal Fasteners For Conveyor Belts

Metal fasteners and repair plates for conveyor belts are manufactured by Armstrong-Bray & Co., 5364 Northwest Highway, Chicago 30, Ill. The Plategrip fasteners are designed to permit the butting of the belt ends close together. And they are so formed, the manufacturer states, that the ends of each pair of plates clamp and compress the belt in a wide radial area around the bolt, cushioning the direct pull and spreading the tension uniformly across the belt.

The Plategrips consist of two metal plates separated by a bolt. They are equipped with sharp prongs to penetrate and hold tight to the belt. Nuts are used to hold the bolts securely in place. The Plategrip fasteners are available in six sizes to accommodate all belt thicknesses from ¼ to 1½ inches. Three bolt-and-nut combinations are suitable for the six plates.

Special Plategrip tools to speed installation of the fasteners include a spacing template, a punch or drill for making the bolt holes in the belt, a wrench for tightening the nuts, and a bolt breaker for breaking off the excess bolt length.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 18.

Tetrick Joins Southwest

A. H. "Art" Tetrick has joined the Construction Machinery Division of the Southwest Welding & Mfg. Co., Alhambra, Calif. He is named to the position of Sales Manager of that Division of the company.

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—because FLEXCELL BITUMINOUS FIBRE EXPANSION JOINT offers you all these advantages.

1. Flexcell is Non-Extruding. Millions of tiny air cells permit compression without displacement. Will not extrude under pressure by adjacent concrete slabs.

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4. Flexcell is Durable. Proved by years of actual use in major installations all over the nation. Withstands severest service, extremes of heat and cold. Made proof against termites and fungus by the patented Ferox process.

5. Flexcell Adheres Firmly. Its rough-textured surface grips and holds concrete more firmly. Keeps joints closed.

6. Flexcell Stays Put. No possibility of any piece, splinter, or strip working loose and protruding above surface of slab, thus impeding or endangering passing traffic.

7. Flexcell is Moisture Resistant. Each of the long, tough bagasse fibres in Flexcell is coated with a durable moisture-proofing compound by the exclusive Flexcell Process.

8. Flexcell Has Easy Workability. Lightweight, easily cut with hand saw, readily stored, holds its shape indefinitely. Gives neat, finished joint with no trimming.

9. Flexcell is Always Uniform. Precise scientific control during manufacture assures uniformity. Every square foot is uniformly dependable.

10. Flexcell is Versatile. Outstanding for work requiring special cutting, tapering, and fabricating. Unsurpassed for concrete work above grade, around bridges, grade separations, overpasses, and concrete building construction. Replaces products of much greater cost.

11. Flexcell is Economical. Measured in terms of performance and service, Flexcell is indisputably the most economical product of its type on the market.

12. Flexcell is Quickly Available. Flexcell distributors conveniently located from coast to coast are kept supplied with ample stocks at all times. These distributors are equipped to handle all requirements, special sizes, cutting, punching—promptly, without delay.

PROMPT DELIVERY!

Write today for complete specifications and prices on Flexcell Bituminous Expansion Joint.

THE CELOTEX CORPORATION • CHICAGO 3, ILLINOIS

Australian Airport To Take World Traffic

First-Stage Enlargement Involves River Diversion, Extensive Fills, Traffic Bridge, Sewer Viaduct

By H. BOWDEN FLETCHER, D.F.C., Australian Correspondent for Universal Trade Press Syndicate

✦ WORK has begun on a project to develop Kingsford-Smith Airport at Mascot, Sydney, Australia, as an international air terminal. The Department of Civil Aviation began its investigations of the project in 1942 but was interrupted by the onset of war. It resumed them in 1944, and after 2½ years of research its designing engineers produced a master plan for the new airport.

The plan envisages an airport constructed to standards of safety and capacity as laid down by the International Civil Aviation Organization. When completed, the airport will be capable of handling both sea and land aircraft. The total cost, it is estimated, will be approximately $65,000,000 (£A20,000,000)—provided, of course, that costs do not increase in the meantime.

The development work will proceed in four stages, the first of which is now under way at an estimated cost of $19,500,000 (£A6,000,000). This stage provides, first, for the diversion of Cooks River, which meanders around the existing airport. The diversion will provide additional land for runways, since it will make available the ground on the opposite side of the river—ground now occupied by an 18-hole golf course, a race track, sports grounds, and many factories and houses.

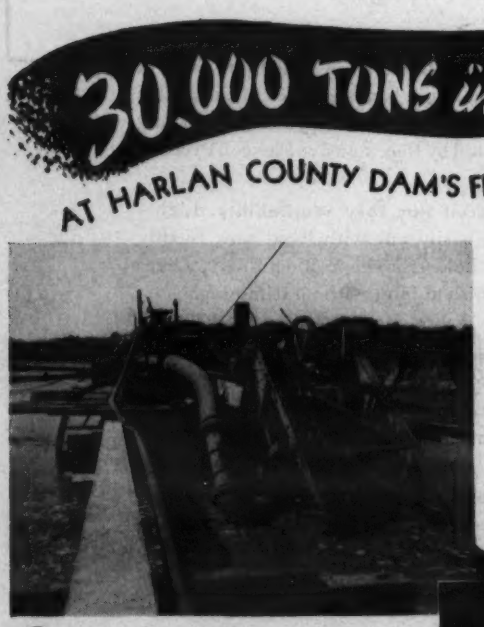
Associated with the river diversion are two other major construction jobs. The first is a new traffic bridge, about 150 yards in from the shore of Botany Bay, to carry General Holmes Drive over the new river site. (Before work could start on the pier foundations of the reinforced-concrete bridge, Holmes Drive had to be diverted slightly towards the bay.) The second job is the construction of a new sewer viaduct over Muddy Creek to replace the existing one.

The detailed plans for each section of the work are prepared by the Department of Works and Housing. The Department of Main Roads is responsible for the traffic bridge, and the Metropolitan Water, Sewerage, and Drainage Board is handling the sewer viaduct. The diversion cut and the essential fill work are being done by the New South Wales State Department of Public Works, which has the plant necessary for such a large job. The work is done on a cost-plus basis, and the Department of Civil Aviation reimburses the State for the actual cost of construction, with an allowance for overhead and supervision.

(*Continued on next page*)

Adastra Photo
This air view of the Kingsford-Smith Airport near Sydney, Australia, shows Cooks River half filled. Part of the swamp area still to be filled can be seen in the upper left-hand corner, and the temporary bridge across the river appears in the center of the photo. The level of the areas in the foreground is being raised 9 feet. Cinder tracks on top of the early fill are visible.

30,000 TONS in 435 HOURS
AT HARLAN COUNTY DAM'S FINE AGGREGATES PLANT



It's an EAGLE "Swintek" at Harlan

It's an EAGLE Classifier at Harlan

On-the-job production of sand and gravel helps whip your rising freight and other costs. More & Alsop's Eagle-equipped Harlan County Dam's Fine aggregates Plant produced 30,000 tons of salable material in 435 hours of operation to meet the specifications of the Bureau of Reclamation. Here's how the Eagle "Swintek" Dredging Ladder and Eagle Screw Classifier teamed up at this Kansas plant to meet the original specifications:

Grading	Spec. %	% Ret.	Grading	Spec. %	% Ret.
No. 4	0	.5	No. 50	20-30	27.7
No. 8	7-13	9.7	No. 100	12-22	13.2
No. 16	12-18	17.0	No. 200	3-7	3.0
No. 30	20-30	26.0	Pan	1-5	2.9

A 6" Dredge pump was used with the 50' Light Duty "Swintek" which loosens and agitates the deposit while keeping boulders and other material out of the suction line. The Eagle Screw Washer-Classifier-Dehydrator features the new perforated flights for more complete dewatering. Write for catalog.

Sand and Gravel Equipment
"SWINTEK" DREDGE LADDERS—SCREW WASHERS
LOG WASHERS—DEHYDRATORS—SAND TANKS
CLASSIFIERS—REVOLVING SCREENS

SINCE 1872 Progress...Service
EAGLE IRON WORKS
159 HOLCOMB AVE. • DES MOINES, IOWA

JACKSON
SIDE FORM VIBRATOR
FOR CONCRETE PAVING

SAVES BETTER PART OF 2 MEN'S LABOR

This machine, which may be mounted on any modern finisher, Jackson Vibratory Paving Tube or spreader, employs two vibratory units that are simultaneously lowered into or raised from the concrete through controls on the deck of the finisher or spreader by the regular operator. It eliminates manual vibrating of concrete at the side forms.

INSURES A BETTER JOB . . . . . .

Vibrators operate well ahead of front screed of any finisher, will operate close to forms or reinforcement without fouling, will ride over any obstruction encountered and will NOT penetrate through the concrete into the sub-base. Thorough compaction is assured regardless of speed of finisher or spreader. In reverse travel, vibrators may be elevated or left in concrete without damage to concrete or equipment. NO SPOTS WILL BE MISSED WHERE THIS MACHINE IS USED.

RUGGED—TROUBLE-FREE . . . . . .

Vibrators are electric vibratory motors in which the vibratory medium is an integral part of the motor. Vibration is transmitted to a simple loop of steel tubing bolted to the lower end of the motor. Thus all flexible shafts or long rigid shafts, which can be a major source of trouble, have been eliminated. Motors are exceptionally rugged, having been proved in more than 25 years of severe service. Power is supplied by reliable Jackson Power Plant on the finisher or spreader deck.

Nothing approaching the efficiency of this machine has ever before been offered for this purpose. Write for the complete facts, NOW!

OTHER MONEY-MAKING PAVING EQUIPMENT

Jackson Vibratory Paving Tubes for vibrating full slab-widths of highway and airport paving; Jackson Municipal Paving Unit (manually guided electric vibratory screed and power plant); Vibrators for every type of paving and construction.

Manufactured by ELECTRIC TAMPER & EQUIPMENT CO. for

JACKSON VIBRATORS, INC., LUDINGTON, MICH.

Temporary Work Bridge

It was considered advisable to commence the filling of Cooks River from both banks simultaneously. So one of the first jobs on the project was the erection of a temporary bridge over the river, at a point about one-third of the way between the beginning of the diversion cut and the existing river outlet.

The bridge was built on wooden piles driven into the riverbed. Its 300-foot length comprises seven spans. Supporting framework consists of military pontoon landing-bay sections of the small box-girder type. These are surmounted with a wooden deck capable of two-way truck traffic.

If haulage trucks had been forced to use the only existing permanent bridge over the river, haul distances would have been 5 miles longer. The temporary bridge also permits spoil to be dumped on the low swamp ground within the area of the existing airport.

Diversion Cut

The diversion cut is to be 500 feet wide from bank to bank, and the depth will be 18 feet below mean sea level, with the bottom level R/L 12.5. Work on the cut began at a point about 150 yards inshore from Botany Bay and proceeded towards the junction of Muddy Creek with the existing river, about 1½ miles from the present outlet to the bay.

Most of the surface excavation of the sandy soil is being handled by Caterpillar D7 tractors with dozers, power shovels, Barber-Greene bucket loaders, and draglines. The dozers are used to push up stockpiles of material which the bucket loaders and power shovels load to trucks to be hauled away.

So far, no stone, shale, or gravel has been encountered in the work. But as the cut deepens, ground water is usually encountered at depths varying from 1 to 3 feet (it is universal in this area). And at this stage, from two to six draglines take over the work almost entirely. The types in use include a ⅝-cubic-yard diesel-driven Harman, a ¾-cubic-yard Koehring powered by an industrial gasoline engine, and a 2¼-cubic-yard steam-driven Bucyrus-Erie, all from war-surplus stores.

To assist the draglines in their work, pumps have been installed at two open sumps to force out the ground water and keep it down to 18 feet below mean sea level — the final depth to which the excavation is to go. Two pumps are handling 500,000 gallons a day. One is a 6-incher which works 14 hours a day, and the other is a 4-incher which works 5 hours a day. The water is pumped into a storm-water drain which runs parallel to the existing surface sewer lines but between them and the cut. This drain empties into Muddy Creek.

Haul Roads

Eighteen trucks, on an average, are removing about 8,700 cubic yards of spoil from the cut area each week. They haul it distances ranging from ½ to 2 miles, with an average of about 1¼ miles. As the ground is flat, no steep grades hamper their work. However, the sandy nature of the soil has made it necessary to prepare temporary roads from the cut to the fill to keep the trucks from bogging down.

Boiler ash from the Bunnerong Power Station 5 miles away is spread over the surface of these roads, wet to a depth of 12 inches, and graded until it consolidates to a depth of about 6 inches. Regular watering and grading keep the surface in excellent condition, and the scheme has proved both effective and economical.

Fill Work

It is expected that spoil taken from the diversion cut will amount to 2,500,000 cubic yards. Since the existing river takes a longer distance to reach Botany Bay than the new cut, this fill will not be nearly enough to complete the closing of the old riverbed. Accordingly, a line of sand dunes on the shore of the

(Continued on next page)

"Low Over-All Costs With My Blue Brute Teams," Says Jim Slattery

Here are facts — not promises — about how Blue Brutes cut construction costs. Mr. James M. Slattery, of the nationally known Slattery Contracting Co., Inc., Woodside, N. Y., writes:

"We have found that Blue Brutes are dependable performers. The portable compressors require very little maintenance and their cost of operation is low.

"On the job at 51st St. and Fifth Ave., drilling and blasting of considerable accuracy were required. The UMW-40 Wagon Drills were fast drilling, easy to handle and produced work of unusual precision.

"All our compressors and air tools are used on a wide variety of jobs under vastly different conditions. We have learned we can rely on Blue Brutes to give us satisfactory performance on any drilling job."

Once again you can be selective in buying construction equipment — can refuse to accept anything but top quality and immediate delivery. Get further facts proving *there's more worth in a Blue Brute* from your nearby Worthington-Ransome Distributor, or write us direct.

H9-1

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Worthington Pump and Machinery Corp.
Construction Equipment Department
Harrison, New Jersey

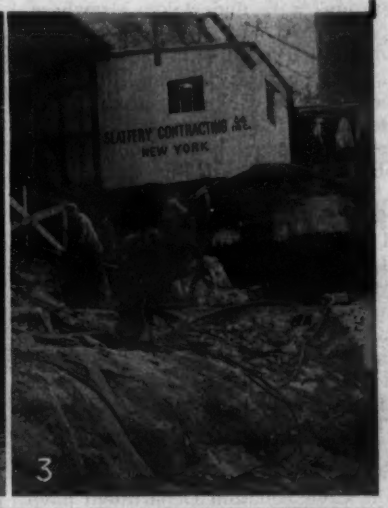
Distributors In All Principal Cities

BUY BLUE BRUTES

BLUE BRUTE TEAM-MATES AT WORK ON MANHATTAN'S BEDROCK

Line-drilling for the foundation of the 19-story Crowell-Collier Building at 51st St. and Fifth Ave., N. Y. C., cut down 30 ft. through rock. Photos show part of the Worthington Blue Brute equipment used by the Slattery Co., for the extremely accurate drilling required on this location. (1) Two Blue Brute 500′ Portable Compressors deliver a steady supply of air through their easy-breathing Feather*Valves. (2) One of the UMW-40 Blue Brute Wagon Drills — fast, powerful drilling machines that swing into action at any angle. (3) Two of a battery of Blue Brute Hand-Held Rock Drills — hard slugging, precision balanced, easy handling WJ-55's.

*Reg. U. S. Pat. Off.

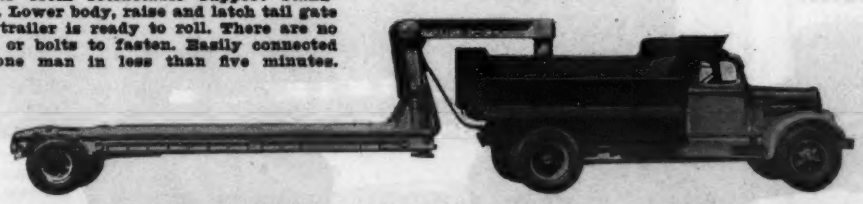


IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

MEAD

Fits in All Dump Truck Bodies

To connect with truck simply lower tail gate and back truck under fifth wheel, elevate dump body to remove weight of trailer from retractable support standards. Lower body, raise and latch tail gate and trailer is ready to roll. There are no pins or bolts to fasten. Easily connected by one man in less than five minutes.



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- Welded construction throughout
- Available in capacities 10 to 25 tons

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MEAD Machine and Iron Works, Inc. 606 Lexington Avenue, Warren, Pa.

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THE AMERICAN CANCER SOCIETY, INC.

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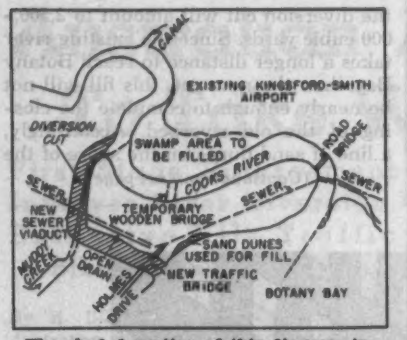


The shaded portion of this diagram indicates the river-diversion cut which had to be made to gain more land for the enlargement of Kingsford-Smith Airport in Australia. The swamp area north of the temporary bridge will require 700,000 yards of fill material.

Australian Airport To Take World Traffic

(Continued from preceding page)

bay near the outlet of the new cut was used for a section of riverbed fill.

The dunes contained 500,000 cubic yards which was moved by 12 Tournapulls, 6 self-propelled scrapers of 17-cubic-yard capacity each, a 12-cubic-yard Carryall, and Caterpillar tractors with dozers. The Tournapulls, working on the 8,800-foot haul entirely in sand, handled 141 cubic yards per hour, consolidating as they spread. The tractor-dozers assisted the self-propelled scrapers to load, and pushed up stockpiles from which power shovels loaded trucks.

It should be remembered that the existing river must be permitted to function until the new cut is ready for operation. Therefore, it cannot be completely blocked until that time arrives. At the date of writing, a considerable section of the old riverbed, in the vicinity of the temporary bridge, had been almost half-filled. But no more work on this phase of the project was to be done for the time being. Fill operations were undertaken elsewhere, instead.

In addition to filling in the old riverbed, it is necessary to raise, by some 9 feet, the level of the new ground to be included in the airport area. This is being done to overcome ground-water problems, provide effective drainage of the whole of the airport, raise the surface above existing sewerage level, and make certain that the final runways will be above river flood level.

It is proposed to give the airport the shape of a cap peak, with the high side along the southern boundary. At the high points the level will be R/L 21, and the fall will be gradual to the west, north, and east, down to R/L 4.5.

This work, plus filling in the rest of the existing riverbed, will require an immense amount of fill. So engineers of the Civil Aviation Department have designed a special dredge which will take additional fill from the bed of Botany Bay.

Where possible, the dredge will pump the sand directly to the fill areas through mild-steel pipes. Otherwise, it will pump the sand onto stockpiles from which it will be loaded to trucks by power shovels and bucket loaders.

It is anticipated that at least 8,000,000 cubic yards will be pumped from the bay. Removing this material will also help to deepen the water over that section of the bay which will be incorporated in Stage IV of the master plan for the use of sea-type aircraft.

Meanwhile, efforts are being concentrated on raising the level of the ground between the existing surface sewer lines and the river itself. Here Caterpillar D7 tractor-dozers are busy spreading fill from the spoil dump. Working on a lead of about 200 yards, they push the spoil out towards the river. In their constant movement back and forth, they are also consolidating the fill. When the required level has been reached, ash is spread over the surface, and the fill dump is moved forward so that the haul trucks help in the consolidation.

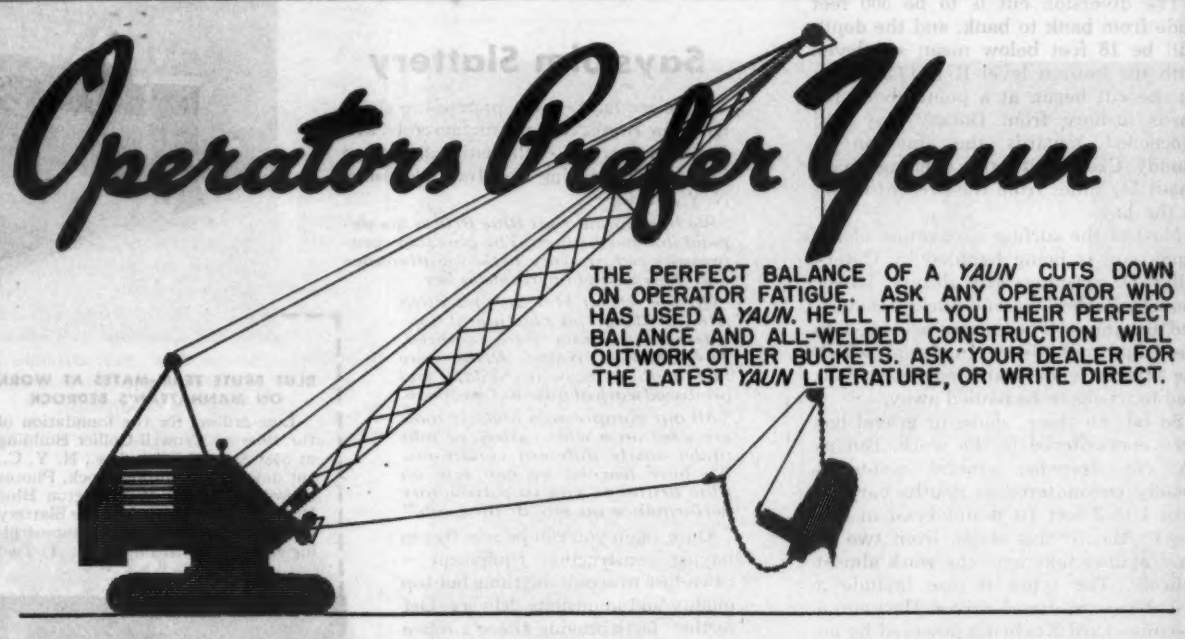
Sewer Viaduct

A portion of Muddy Creek which will be included in the diversion cut has to be widened. But this work cannot proceed until the Water, Sewerage, and Drainage Board has completed its new sewer viaduct at a cost of $1,000,000 (£A300,000). This work must be done without being the cause of any interruption to the existing sewer lines.

The new sewer viaduct will be a reinforced-concrete structure 560 feet

(Continued on next page)

As part of Stage 1 enlargement work at Kingsford-Smith Airport, Australia, foundations are being laid for a new concrete bridge to take General Holmes Drive over the new bed of Cooks River, just near the entrance to Botany Bay.


Operators Prefer Yaun
THE PERFECT BALANCE OF A YAUN CUTS DOWN ON OPERATOR FATIGUE. ASK ANY OPERATOR WHO HAS USED A YAUN. HE'LL TELL YOU THEIR PERFECT BALANCE AND ALL-WELDED CONSTRUCTION WILL OUTWORK OTHER BUCKETS. ASK YOUR DEALER FOR THE LATEST YAUN LITERATURE, OR WRITE DIRECT.
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BATON ROUGE, LA.

BOY! HOW IT GETS THE STUFF UP THERE . . . Best Hoist I've Seen!
Saves time . . . handles easily . . . sets up anywhere. Doesn't jerk loads. Workmen like it.
Will pay for itself on first couple of jobs. Air cooled . . . works smoothly Winter or Summer.
Write for circular.
KING Portable Hoists
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CUMMER ASPHALT PLANTS
COMPLETE PLANTS FROM 45 TO 100 TONS PER HOUR
PROMPT SHIPMENT ON ALL SIZES
FEEDERS, STORAGE BINS PUMPS - TIMERS AND OTHER UNITS AS REQUESTED
LITERATURE UPON REQUEST
CUMMER NEW PORTABLE DRYER
—45 TO 55 TONS PER HOUR HOT MIX—
FURNISHED COMPLETE WITH INDIVIDUAL MOTOR DRIVES, AND WITH ENCLOSED COLD ELEVATOR, FAN AND BURNERS (EITHER HIGH OR LOW PRESSURE).
CAN BE FURNISHED WITHOUT WHEELS AND AXLES.
COMPLETE TOWER UNITS, VIBRATING SCREENS, HOT ELEVATOR AND BINS, FURNISHED WITH DRYER IF DESIRED.
LARGER SIZES 80 TO 100 TONS PER HOUR (COMPLETE DRYING AND MIXING UNITS) ALSO AVAILABLE
THE F. D. CUMMER & SON COMPANY
BUILDER OF FINE ASPHALT PLANTS
CLEVELAND 15, OHIO USA

Above, draglines work on the diversion cut to take Cooks River on a new course to Botany Bay, Australia. In the background are the masts of the radio transmitting station at Kingsford-Smith Airport. At right, a Tournapull, assisted front and back by tractors, collects fill material from sand dunes on the shore of Botany Bay.

long, with a center 60-foot span which will have a clearance of 9 feet 3 inches at high water. The existing viaduct carries two mains, but the new one will combine them in one three-barrel channel with overall outside dimensions of 33 feet 10 inches x 7 feet 10 inches. The foundations of the viaduct piers will be based on rock and will be constructed under the caisson system. Work has already begun on the foundations, and it is hoped to have the job completed by the middle of this year.

Traffic Bridge

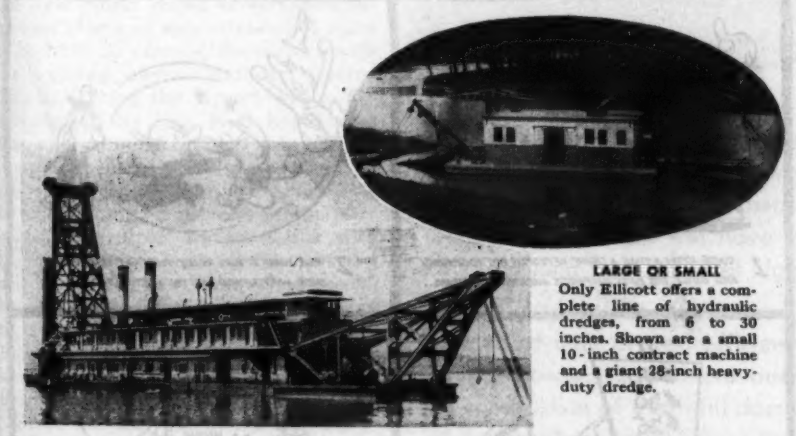
The traffic bridge over the Botany Bay end of the diversion cut is to be 568 feet long and 78 feet wide. Work on it will proceed in parallel with the excavation, and it is scheduled to be ready when the final section of the spoil between it and the bay is removed. It will be entirely of reinforced concrete, and concrete caissons for the foundations of the supporting piers have already been placed in position.

When these structures are nearing completion, the work of closing off Cooks River, at the point where the temporary bridge has been erected, will be continued so as to coincide with the final opening of the new course into the bay. When this is accomplished, the remaining sections of the riverbed will be filled with the spoil pumped from Botany Bay.

Runway Preliminaries

As the main runway of 8,000 feet has been located right down the center of the old riverbed, the consolidation of the fill is a matter of vital importance, and the engineers are paying particular attention to the problem. They realized that the normal procedure of using

(Continued on next page)



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Only Ellicott offers a complete line of hydraulic dredges, from 6 to 30 inches. Shown are a small 10-inch contract machine and a giant 28-inch heavy-duty dredge.

How ELLICOTT hydraulic DREDGES operate at Lowest Cost under all conditions!

ELLICOTT is the only organization that builds and designs hydraulic dredges and dredge components exclusively . . . there is no divided responsibility. That means each Ellicott Dredge is a *balanced unit* because all components work as a team with highest efficiency. Ellicott design also means operating with a minimum of skilled labor, resulting in overhead savings.

Ellicott service starts by designing your dredge for operation under varied conditions so that it outlasts any temporary work. *Proper hydraulic design* eliminates unnecessary wear, and parts that must wear under operation are easy to reach, inexpensive to replace, thus cutting maintenance costs.

Under all conditions, Ellicott Dredges operate at the lowest cost per cubic yard and they are designed for long life. Over 75% of the Ellicott Dredges built before 1928 are in operation today! For economy, long life and usefulness, specify Ellicott. You'll find Ellicott's 63 years of experience will give you complete satisfaction. For complete information, write today for the latest Ellicott Catalog to: ELLICOTT MACHINE CORPORATION, 1613 Bush Street, Baltimore, Maryland, U. S. A.

- COMPLETE LINE from 6 to 30 inch equipment for all dredging requirements.
- 63 YEARS OF EXPERIENCE with hydraulic dredges.
- UNDIVIDED RESPONSIBILITY . . . designed, built, delivered under one Ellicott contract.
- PROVED PERFORMANCE in the U. S. A. and abroad.

ELLICOTT HYDRAULIC DREDGES

any type — any size — any service

Why users prefer the new LaCROSSE Spring-Mounted DF6C

FRANK MASHUDA CO., MILWAUKEE, says:

"We've found our 24-ton LaCrosse DF6C much easier to handle than solid axle trailers. Spring mounting also gives improved riding . . . better road bearing . . . permits higher speeds with less tire wear for comparable loads and mileage."

H. B. CHURCH TRUCK SERVICE CO., BOSTON

"Higher travel speeds without jolting the load sold us on LaCrosse spring-mounting. Our 19-ton DF6C easily carries 12,700 bd. ft. of lumber per trip on 40-mile hauls . . . also saves time loading and transporting all kinds of heavy bulk loads.

YOU, TOO, can move big loads faster, easier, at less cost with LaCrosse *spring-mounted* trailers. 19 to 33-ton capacity . . . flat, drop or low drop designs. Also standard low beds from 8 to 67-ton cap.

LC-5

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LA CROSSE TRAILER CORPORATION, La Crosse, Wis.

☐ Rush complete facts on new 19 to 33-ton spring-mounted trailer.

☐ I may be interested in this type trailer about..... (date)

for hauling ..... (type of equipment)

Name..... Title.....

Employed by.....

Address.....

City..... State.....

LaCROSSE

Low-Cost TRAILER TRANSPORTATION

Australian Airport To Take World Traffic

(*Continued from preceding page*)

dozers to spread and consolidate would not be sufficient, so a special Porter Super-Compactor of 200 tons was purchased in the United States. It recently arrived and is now in use.

This machine can be used in weights ranging from 50 to 200 tons. The lighter weights will be used in the river where the moisture makes the material soft; additional weights will be added as the surface rises, until at 14 feet the full 200 tons will be in operation.

Until the results of this consolidation are known, final specifications of the 8,000-foot runway construction cannot be decided. Trouble is anticipated before the actual runway construction can be commenced, so the engineers are maintaining a policy of wait and see.

Runway Design

Under Stage I, there are to be four runways of 8,000, 6,200, 5,600, and 5,000 feet, all with clear overruns of several hundred feet. In designing them, consideration will be given to the fact that they may have to carry aircraft with a gross weight of 300,000 pounds.

This single runway system will cater to aircraft movements of up to 500 a day. It should suffice for a minimum of 10 years, during which time preparations will be made for a duplication of it.

Under Stage II, provision is made to extend the main runway to 10,000 feet if required, and at later stages to 15,000 feet should that length be needed. When the runways are duplicated under Stage II, they will be not less than 3,000 feet apart, and will be designed so that simultaneous movement of aircraft can take place without any machines having to cross a runway in use. Major runways will be 200 to 300 feet wide, situated in the center of landing strips 1,000 feet wide.

In general, the strength and length of Kingsford-Smith Airport runways will be similar to those of Idlewild International Airport in New York. The maximum longitudinal grade will be 1 per cent; maximum transverse grade will be 1.5 per cent.

Aprons, Buildings

The aprons will be constructed of reinforced concrete, up to 14 inches thick, laid on a specially prepared and compacted sandstone base. They will be designed to carry a wheel load of 100,000 pounds and a tire pressure of 100 psi. The area to be laid will be equivalent to 100 miles of road.

(*Concluded on next page*)

Mall® VIBRATORS

BRING OUT THE BEST IN CONCRETE

A SIZE AND MODEL FOR EVERY JOB

All of the economies and advantages you expect from concrete can be easily and quickly accomplished by vibration with Mall Vibrators. They place stiffer mixes than can be placed by hand, saving water, cement and sand and permitting earlier removal of forms. They place concrete faster and better with less effort in areas inaccessible to hand methods. Honeycombs and voids are eliminated, saving costly hand patching. A better bond is achieved with reinforcement and successive layers, absorption is reduced, while a greater density, watertightness, increased compressive and flexural strength is secured. For their size, Mall Vibrators place more concrete than any other vibrator.

2 H.P. and 4 H.P. Gasoline Engine models; 1½ H.P. Electric model; 1½ H.P. Electric Short-Coupled model; and a 7500 f.p.m. Pneumatic model are available. Gasoline Engine models also operate other tools.

Let your Mall Dealer help you select the proper equipment for your needs . . . or write for complete literature on Mall Vibrators.

New Mall One-Man Short-Coupled 1½ H.P. Electric Vibrator—excellent for placing concrete in small forms, thin wall sections, and hard-to-reach spots in forms.

MALL TOOL COMPANY, 7743 South Chicago Ave., Chicago 19, Ill.

MODEL 90M 6 inch

MADE IN ALL SIZES
7M - 10M - 15M - 20M
30M-40M-90M-125M

GORMAN-RUPP'S NEW PUMPS

WE CHALLENGE ANY PUMP TO MATCH THEIR PERFORMANCE

With a new complete line of Contractors' Pumps, Gorman-Rupp has topped their own past high record of performance with a better pump --

-- QUICKEST PRIMING
-- HIGHEST PRIMING
-- PUMPS MORE DIRTY WATER

Compare them for priming speed:

The new Model 15M (3") primes at 25 ft. suction lift in 61 seconds.

The new Model 90M (6") primes at 25 ft. suction lift in 44 seconds.

And the Gorman-Rupp is still the most simple pump --

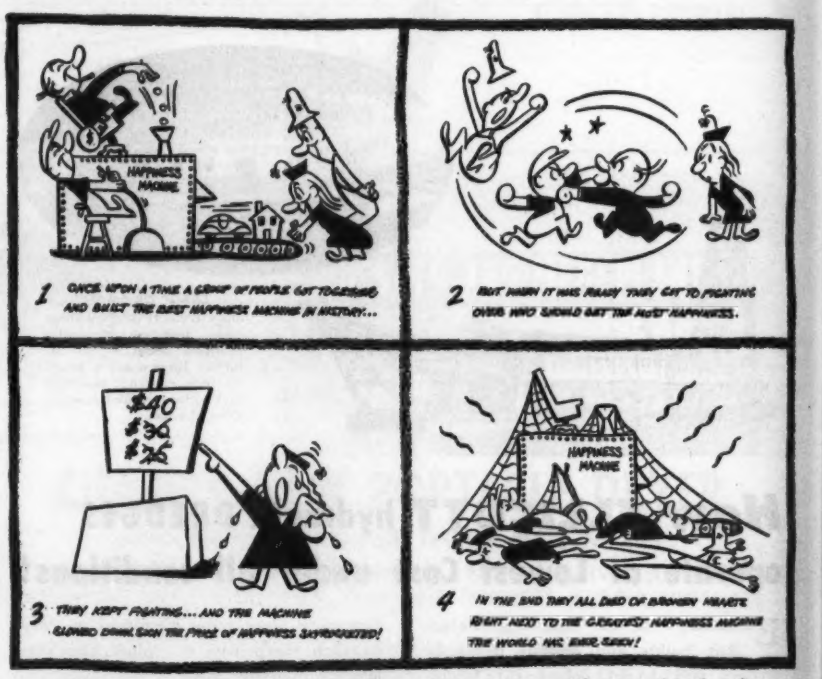
No ports, no valves, no clean-out plates, nothing to cause stoppages.

Write for the new Contractor's Bulletin 8-CP-11

THE GORMAN-RUPP Guarantee

Our distributors are authorized to put a Gorman-Rupp Contractors' Pump on any pumping job, anytime, anywhere, alongside any other make pump, size for size. The Gorman-Rupp pump is guaranteed to pump more dirty water more hours, using less gasoline and to prime quicker than any other self-priming pump. If it isn't the best all around pump, our distributor will accept the return of the Gorman-Rupp pump and pay the user any installation expense incurred.

THE GORMAN-RUPP COMPANY
MANSFIELD OHIO



1 ONCE UPON A TIME A GROUP OF PEOPLE GOT TOGETHER AND BUILT THE BEST HAPPINESS MACHINE IN HISTORY...

2 BUT WHEN IT WAS READY THEY SAT TO FIGHTING OVER WHO SHOULD GET THE MOST HAPPINESS.

3 THEY KEPT FIGHTING... AND THE MACHINE GLOWED DOWN, SUCH THE PRICE OF HAPPINESS SKYROCKETED!

4 IN THE END THEY ALL DIED OF BROKEN HEARTS RIGHT NEXT TO THE GREATEST HAPPINESS MACHINE THE WORLD HAS EVER SEEN!

Now, here's a better ending ! ! !

They stopped fighting among themselves.

They got together like sensible human beings . . . management, labor, farmers, consumers.

And they said, "Look . . . we've got something wonderful and special here in America . . . something so good it saved all the rest of the world twice in 25 years.

"It isn't perfect yet . . . we still have ups and downs of prices and jobs. But our system has worked better than anything else that's ever been tried.

"And we can make it better still . . . we can build for peace as we built for war without even working harder—just working *together*.

"We can invent and use more and better machines, can apply more power. We can work out better methods in our factories, stores and offices. We can have better collective bargaining. We can develop more skills on the job.

By doing these things, we can produce more every hour we work, at constantly lower costs.

"The bigger the flow of goods, the more there will be for everyone. Higher wages to buy the good things of life and more leisure to enjoy them!"

So that's the way they did it. And they lived happily ever after.

Approved for the
PUBLIC POLICY COMMITTEE
of the Advertising Council
by: Evans Clark, Executive Director, Twentieth Century Fund. Paul G. Hoffman, former President Studebaker Corporation. Boris Shishkin, Economist, American Federation of Labor.

Published in the Public Interest by:
CONTRACTORS & ENGINEERS MONTHLY

WANT TO HELP? MAIL THIS!

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11 West 42nd Street, New York 18, N. Y.

I want to help.

I know that higher wages, lower prices, shorter hours and larger earnings can all result from producing more goods for every hour all of us work.

Therefore, I will ask myself how I can work more effectively every hour I am on the job, whether I am an employee, an employer, a professional man or a farmer.

I will encourage those things which help us produce more and add to everyone's prosperity—things like greater use of mechanical power, better machines, better distribution and better collective bargaining.

I will boost the good things in our set-up, and help to get rid of the bad.

I will try to learn all I can about why it is that Americans have more of the good things in life.

Please send me your free booklet, "The Miracle of America" which explains clearly and simply, how a still better living can be had for all, if we all work together.

NAME .....

ADDRESS .....

OCCUPATION .....

Concurrently with the construction of the aprons will come the erection of the administrative, hangar, and workshop buildings, for which some 2,000,000 square feet with a reserve of 1,000,000 square feet has been allocated. Provision is also made for car-park areas capable of handling thousands of autos. And adjacent to the terminal building, there will be an area for the use of rotary-wing aircraft. These are visualized as being used by the Post Office to bring mails from the central sorting room to the airport; and possibly by airline operators to transport passengers to and from the city.

Covering approximately 100 acres, the building area is planned on the decentralized system which is considered the most practical for dealing with heavy traffic densities. Under this system, each operating company will rent the ground from the Department of Civil Aviation, which controls the airport, and erect its building to suit its own requirements—provided the architectural design adopted complies with the overall plan.

The control section will be in a higher building located behind the air operator's building. It will embrace all the administrative dining-room, post-office, customs, medical, immigration, banking, meteorological, and shopping facilities considered desirable to serve the expected 10,000 employees working at the airport and the possible 10,000 passengers each day.

Special loading galleries are designed for both passengers and freight. In the initial stage, they will be 1,500 feet long and capable of handling 24 aircraft at one time. Under Stage II, their length will be extended to 3,500 feet.

Finally, as part of the overall scheme, arrangements have been made between the Department of Civil Aviation and the New South Wales Government for a new railway of approximately 4 miles to be built, to connect the airport with the existing electric railway system. This will bring the airport within 6½ minutes of the city. It is hoped that this vital communication link will be completed before the first stage of the airport construction is finished. This is essential, as Kingsford-Smith Airport has no direct transport link with the city except early in the morning and late in the afternoon, when special buses serve the regular employees going to and returning from their work. Before and after those hours, employers have to arrange special transport for their shift workers.

Stage I of this vast construction program is scheduled for completion by 1952, but accomplishment of this goal is entirely dependent on the supply of vital construction materials. It is not anticipated that the schedule can be maintained, and a later finish is more than likely. Housing requirements must take priority over all other forms of construction in Australia.

Head of the designing staff for the Airport was Dr. K. N. E. Bradfield, who now represents Australia on the executive staff of International Civil Aviation Organization at its headquarters in Montreal, Canada.

Diesel and Gas Engines

Information and data on a complete line of gas or diesel engines is contained in a stiff-bound catalog issued by the Cooper-Bessemer Corp., Mt. Vernon, Ohio. The catalog illustrates each of the engines and lists specifications covering its designation, range of sizes, design and construction, recommended applications, number of cylinders, type of fuel system, built-in accessories, hp ratings, and so forth.

The Cooper-Bessemer engines are made in a variety of styles and sizes, and the information presented in the catalog is designed to serve as a guide in selecting the proper engine model.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 22.

Cable-Dozer Units Eliminate A-Frame

Heavy-duty bulldozers for use with Allis-Chalmers HD-19, HD-14, and HD-10 tractors are manufactured by the Southwest Welding & Mfg. Co., Construction Machinery Division, Alhambra, Calif. The new units have a radiator-guard type of mounting instead of an overhead A-frame construction. They can be furnished for either rear or front-mounted control units.

As special features, this dozer equipment has a moldboard designed to give continuous rolling action to the load, two

The overhead A-frame has been replaced by radiator-guard mounting on Southwest's new heavy-duty bulldozers for A-C HD-10, 14 and 19 tractors.

wear-resistant end bits, reversible cutting edges, and box construction of the main frame to withstand shock and tough going. It is designed to match the power of the equipment to which it is attached, giving high tractive effort and balanced performance.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 55.

Rodney Kox Joins FWD Co.

Rodney Kox has joined the Four Wheel Drive Auto Co. as a special field representative. He will work with FWD salesmen and distributors throughout the United States.

All-State Names Berry

Thomas E. Berry is now Manager of Domestic Sales for the All-State Welding Alloys Co., Inc., White Plains, N.Y. All-State produces a line of welding and brazing alloys and fluxes.

● Nearly four million cubic yards of earth and rock will go into Watauga Dam, a TVA flood control and power project, near Elizabethton, Tennessee. The dam will have a fill structure 900 feet long and 318 feet high, with a base width of 1,275 feet.

Because of their proved efficiency and rugged staying power, "Eucs" have been widely used for construction of earth-fill dams. At Watauga 26 Bottom-Dump and 15 Rear-Dump Euclids haul earth and rock on a twenty-four hour schedule. A Euclid Loader keeps pace with the speed and efficiency of Euclid hauling equipment by providing fast mobile loading of the Bottom-Dumps.

From borrow pit to fill, "Eucs" haul big payloads at Watauga under a wide range of operating conditions. Of sturdy but simple construction, Euclid equipment gives peak performance day after day at low maintenance cost.

Several new models have been added to the Euclid line of earth moving equipment—write or phone your Euclid distributor or representative for descriptive literature and information.

The EUCLID ROAD MACHINERY Co.
Cleveland 17, Ohio

EUCLIDS

The Model DJ Hornet chain saw has open-end blades from 16 to 30 inches; tailstock blades from 24 to 36 inches.

Powered Chain Saws

A line of power chain saws is available from the Southern Distributing Co., Front and Central Aves., Cincinnati 2, Ohio. The Hornet saw is made in two models: the DJ with a weight of 30 pounds, and the standard model which weighs 60 pounds. The DJ is designed for one-man operation and has 16, 20, 24, and 30-inch open-end blades as well as 24, 30 and 36-inch tailstock blades. The other model comes in 24, 30, 36, and 48-inch lengths.

The Hornet saws are powered by single-cylinder gasoline engines. Their cutting heads will swivel through 180 degrees in either direction to permit cutting at any angle while maintaining the engine in an upright position. The sawing blade is lubricated by oil forced under pressure. The teeth and rakers are ground and set to permit a high cutting speed. Ignition is by means of an outside-type magneto. The sawing chain is made from 3-ply nickel-alloy steel; the guide bar from one-piece nickel-alloy steel.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 34.

Tractomotive Has New Home

The Tractomotive Corp. has moved into its new plant at Deerfield, Ill. The plant is located on 26 acres of land north of Chicago and has a floor space of 40,000 square feet. The company formerly was located at Findlay, Ohio.

Tractomotive manufactures a line of front-end shovels and loaders for Allis-Chalmers crawler and wheel tractors, as well as other types of road-building equipment. All products are sold exclusively through Allis-Chalmers dealers.

Engine's Feature Is New Ignition System

Gasoline engines in three new models are announced by the Briggs & Stratton Corp., 2711 N. 13th St., Milwaukee, Wis. The Model 9 is rated at from 2.16 to 3.1 hp; the Model 14 from 3.56 to 5.1 hp; and the Model 23 from 6.5 to 8.25 hp. The manufacturer explains that these ratings are based on standard ICEI procedures.

A feature of these air-cooled 4-cycle engines is the Briggs & Stratton Magnematic ignition system. It is designed to produce a high voltage at low speeds and to incorporate an automatic spark retard and advance for quick, easy, pull-up starting, with no spinning necessary. The system is enclosed in a breaker box unit externally mounted on the crankcase. It consists of adjustable breaker points, condenser, manual stop switch, and a remote stop-switch terminal.

Other features included as standard equipment are plain or ball main bearings, enclosed adjustable governor, a vacuum breather and spring-loaded oil seal to prevent leaks, a snap-on oil-filler cap, and a starter rope or hand crank.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 38.

Portable Crushing Plants

Roller-bearing jaw crushers and portable crushing and screening plants are described in two catalogs prepared by the Austin-Western Co., 601 Farnsworth, Aurora, Ill. Bulletin 2010 discusses points to consider when choosing a crusher, lists eight features claimed for the A-W jaw crushers, and covers in detail the construction and operation of the A-W units—the component parts of the crusher, adjustments which can be made for various sizes of product, and so forth. Specifications cover normal capacity ratings, horsepower requirements, speeds, weights, dimensions, jaws and size of jaw opening, bearings, flywheels, shafts, side plates, and toggle.

Bulletin 1999 tells about the standard 2-unit portable plant, and modifications possible on it, modifications possible on the jaw and roll crushers, the A-W 3-unit plant, and others. It describes in detail the primary breaker unit, the primary unit, the A-W belt conveyors, and the A-W bins and screens. The bulletin also diagrams the path of material through the plants, and the various layouts possible with the A-W units.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 9.

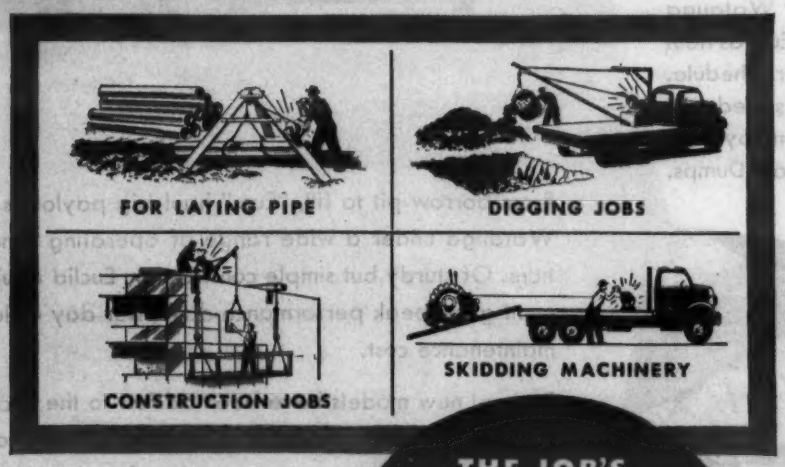
REACH OUT
REACH UP..
with GLEDHILL'S "Hi-Lift"
NEW ROAD GRADER

Good for high banks, advanced, simplified leaning wheel construction

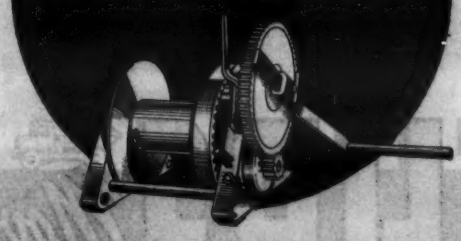
Pneumatic Tires . . . self-locking, raising and lowering device . . . automotive type steering gear . . . all gears in oil-tight gear cases . . . Timken tapered roller bearings.

Write for detailed specifications on this and other Gledhill Road Machinery

THE GLEDHILL ROAD MACHINERY CO.
GALION, OHIO



THE JOB'S A CINCH... WITH
HANDIWINCH



One man lifts or pulls loads up to 10,000 lbs. with the AMERICAN HANDIWINCH. Simple, rugged, weighs only 95 lbs. Carries easily, sets up anywhere. Cut steel gears, two gear ratios. Has demountable tail yoke. Triple-width drum model also available. Sold everywhere; made by AMERICAN HOIST AND DERRICK CO., ST. PAUL 1, MINNESOTA.

ALSO MAKERS OF GENUINE CROSBY CLIPS AND AMERICAN BLOCKS AND SHEAVES.

Learning Your Clutch Needs
Better CLUTCH Design Benefits PRODUCT Design
Automotive and Aircraft
Analyzing the Problem
OVER
CENTER
Trucks and Busses
Designing the Clutch
Tractors and Road Machines
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CLUTCHES
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Fitting the clutch to the product — instead of the product to the clutch — requires that the clutch be designed, manufactured and applied to meet the product's specific needs. Before you approve the design for your next model — double check to see if it includes all the improvements you can give it — with the *right* ROCKFORD CLUTCH application. You are invited to utilize the clutch "know-how" of our engineers to give your design the technical clutch advancements that will provide your product with important competitive advantages.
Mowers and Light Machines
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Machine Tools Production Units
ROCKFORD CLUTCH DIVISION
BORG-WARNER
314 Catherine Street Rockford, Illinois

District Crews Whip Highway Maintenance

Asphalt-Road Doctoring Is Biggest Headache to This District, and Low Budget Does Not Help

♦ CEDAR City, Utah, is one of the main gateways to Bryce and Zion National Parks. It is the stamping ground of one of the biggest deer herds in the country. It is the home of Mormon descendants. It is a mecca for politicians. It is also the center of one of the toughest road-maintenance jobs in the United States.

Known officially as District No. 5, the Cedar City office covers the 1,038-mile highway system of four southwestern Utah counties, and extends part way into another. On an average annual maintenance budget of $350,000, the District keeps the highways maintained in a good, serviceable state of repair, and manages to keep even the most irate citizens and the politicians happy most of the time. As in many a district, however, there are exceptions.

A year ago last October, on the most beautiful, sunny, warm day of the month, one of the local representatives of the public passed through Cedar City. Coincidentally, a state highway truck passed the same spot, equipped with a push plow for snow-removal work.

The legislator did not know that a blinding snowstorm swirled through a district highway pass nearly 11,000 feet high, less than 50 miles distant. He only knew that the day was warm, and that the snow plow was out of place. Yet that little incident had damaging aftermaths when the Legislature resumed sessions.

"Why, the State Road Commission's got so much money now it puts snow plows on those yellow ghosts and runs them up and down the streets of Cedar City in the summertime," he howled, with appropriate gestures.

Happily, these instances are rare and are only a backdrop to the actual business of road repair. For highway maintenance problems are serious and always so with District 5.

System Largely Bituminous

Of the system, 484 miles have a medium-type road-mixed bituminous surface, with only 4 miles of portland-cement-concrete pavement; 350 miles of the total is graded gravel, and 200 miles is graded and drained but unsurfaced. To understand the maintenance problems posed by this system, we have to go back to 1920.

In the early 1920's construction budgets were much lower than they are today. But nonetheless, a great clamor went up from the public in that early day to get as many miles of dustproof surface built as possible. The emphasis was on asphalt rather than on base-course material, and while it is true that some of those original roads are still in service today, many more are not. The heavier, more frequent wheel loads of today have simply beaten hell out of the original highways.

Today, the asphalt surfaces cover nothing but mud, in many places, or very light gravel at best. Failures have been frequent, and base failures in particular are the rule. The State has since set up rigid and very high standards of construction which have corrected the condition with respect to new or rebuilt roads, but the many miles of old highways still present a serious problem of maintenance.

Unhappily, many miles of that early construction are located on transcontinental routes U. S. 89 and 91, which carry some of the most critical traffic.

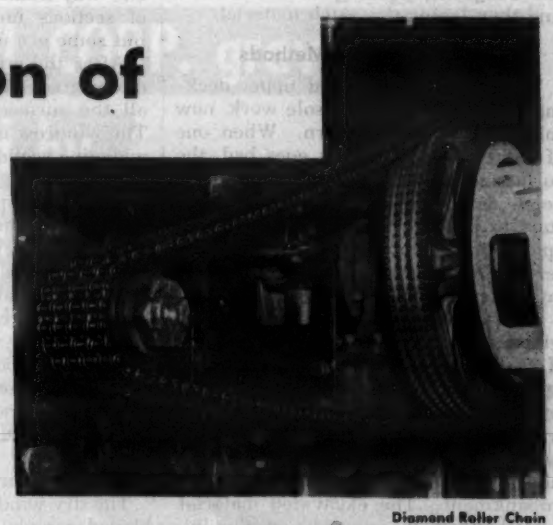
Over a period of years, the District has learned that a 2½-inch road-mixed bituminous half-sole course will do about as much to strengthen the mat as

(*Continued on next page*)

C. & E. M. Photo

Sheridan Flack, District Engineer at Cedar City, Utah, gets out in the field often. Here he inspects a windrow of material which is being road-mixed for a new mat.

For Every Operation of The TL-20 • DIAMOND ROLLER CHAINS

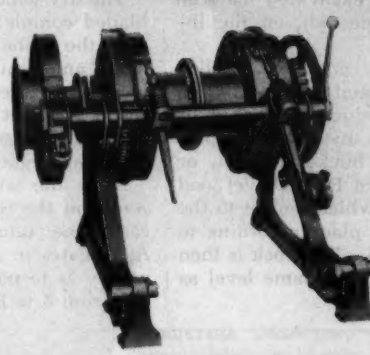


• To go or stop . . . hoist . . . swing and lower . . . to dig . . . crowd or retract, DIAMOND Roller Chains make every motion efficient and sure.

COMPACT AND STRONG. Compactness, flexibility of application and the reserve strength to meet heavy machinery requirements are time-proven advantages of DIAMOND Roller Chains. They deliver the power dependably from prime mover to shaft, and shaft to shaft without waste of space or power. Diamond Drives divide the load over many sprocket teeth, reduce bearing wear for long-life service and minimum maintenance.

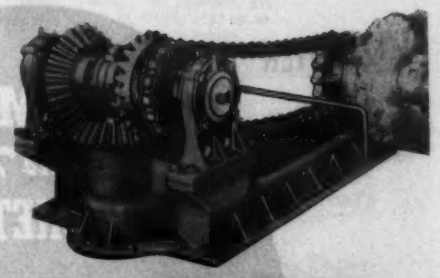
PREFERRED IN THE FIELD. The Lorain TL-20 line is another example of machinery builder and Diamond collaboration—resulting in machines of assured top output, greater speed, and greater user satisfaction.

With so much at stake, leading machinery builders for many years have made wide use of Diamond Roller Chains and machinery users consider these drives as good evidence of sound engineering of the machine itself . . . DIAMOND CHAIN COMPANY, Inc., Dept. 487, 402 Kentucky Ave., Indianapolis 7, Indiana. *Offices and Distributors in All Principal Cities.*



Diamond Roller Chain used as drive chain from motor to clutch shaft which in turn actuates all motion of the machine.

Diamond Roller Chain operating 2 hoist drums.



ABOVE: Diamond Drives on Independent Travel "Unit Assembly"

RIGHT: "Precision Boom Lowering Device" controlled by Diamond Roller Chain (single-strand 1" pitch No. 434.)

Lorain TL-20 equipped with Diamond Roller Chains, handling scrap iron. The TL-20 line also includes shovels, draglines, clamshell cranes, hoes, and Mote-Cranes. Lorain crawlers, too, are driven by heavy duty Diamond Chains.

DIAMOND ROLLER CHAINS

USE RIGHT BUCKET FOR THE JOB

Hayward makes all three—clamshell, electric motor, orange peel. A Hayward recommendation is unbiased.

THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets

District Crews Whip Highway Maintenance

(*Continued from preceding page*)

a heavy course of sub-base material. This work, then, is done with state equipment and maintenance forces, and forms a part of bituminous-road maintenance. The bituminous surfaces also require renewing at least every 5 years, to liven the asphalt surface and to improve the non-skid properties of the roads. This means renewing an absolute minimum of 100 miles a season. Last year some 125 miles were seal-coated, and there was a possibility that 140 miles might be finished before the end of the season.

Maintenance of asphalt highways also includes patching where holes develop. A roving patrol system of maintainence insures that this is done as rapidly as the holes develop. Pre-mixed patch material is always stored on hand at each state highway-maintenance shed. The patches are applied by cutting the hole out to rectangular shape, repairing the subgrade, priming with emulsion, and then laying the patch material.

Half-Sole Work Methods

The use of road-mixed upper decking, or bituminous half-sole work, now follows a regular pattern. When one of the old 18-foot roads goes bad, the surface shows wavy corrugations. Potholes develop. The pavement edges start to ravel. When these conditions appear, the maintenance men mark the section down for a general half-sole improvement job.

Invariably a half-sole job calls for widening to the more modern standards of 22 to 26 feet, with 24 a general average. A motor grader moves in first to prepare the old road for this widening. A cut is made about 6 inches deep, extending from the edge of the old pavement to the shoulder limits of the old embankment. The excavated material is pushed off to one side on the inslopes.

This excavation is then refilled with flexible-base material, usually a crushed gravel produced by state or contract crushers in near-by pits. Front-end loaders, bucket loaders, or the District's ⅜-yard P&H shovel load the rock to trucks, which haul it to the job and dump it in place according to the volume required. The rock is then spread and rolled to the same level as the original pavement.

C. & E. M. Photo
On U. S. 61 north of Beaver, Utah, two motor graders and a Seaman Pulvi-Mixer road-mix a new mat for an asphalt road.

A gravel windrow of crushed rock is then hauled in. The amount of mineral filler for the mix is usually governed to the end result of 2½ inches of compacted mat, and is carefully controlled by a dump man as the trucks arrive. During this and subsequent operations, the stretch under construction is tended by a flagmen at each end, to permit one-way traffic through the job. Length of sections under construction varies, but some are up to 3 miles long.

After the crushed rock is dumped, a motor grader turns it a few times to get all the surfaces of rock particles dry. The windrow is then bladed over to the widening section, completely off the old road.

Hot SC-3 asphalt is now applied over the old bituminous surface at the rate of about 0.25 gallon per square yard. The asphalt is shipped in from California and Utah refineries to a railroad siding somewhere near the job, and re-heated if necessary by tank-car heaters and boosters. Two truck tankers usually haul the asphalt to the job, where they transfer it to the pressure distributor which applies it. The first application of asphalt covers the old bituminous surface completely.

The dry windrow of aggregate is now bladed completely across the highway, over the asphalt. Then it is picked up again and brought back to its original location at the side of the road. The result is a light seal over the old asphalt road, with a small quantity of asphalt in the aggregate.

Next, the windrow is moved to the center of the road, and flattened to receive the remainder of the asphalt. Aggregates in southwestern Utah vary widely as to porosity, and for this reason from 3 to 6 per cent of SC-3 must be applied. It calls for good judgement, experience, and careful laboratory work. The laboratory work is done in Salt Lake City, and Doug Larsen's report lists all of the characteristics of the aggregates for the information of the men in the field.

The asphalt is applied in several shots, and after each shot the windrow is mixed by two motor graders and a Seaman Pulvi-Mixer. In stubborn cases where the aggregates contain some moisture, an additive is used to improve asphalt adhesion. When all of the bitumen is in the windrow, the main road-mixing is ready to begin.

Road-mixing consists of repeated passes over the section under construction, using the two motor graders and the Pulvi-Mixer. The first motor grader flattens the windrow slightly, and the Pulvi-Mixer immediately behind blends rock and asphalt with its tines. A motor grader behind the Pulvi-Mixer then blades the material back into a windrow. This process is repeated until the asphalt is distributed all through the mix, and usually takes about a day. In stubborn, porous aggregate, however, the equipment combination has been known to work 4 days on a windrow.

The completed road-mix is then laid down by the motor graders. The ma-

(*Continued on next page*)

Since I got this MICHIGAN, I've been able to handle a lot of the jobs around the country that I had to pass up before. That shovel gets to the job as fast as my trucks, and under its own power. It'll roll through city traffic without any trouble—and I don't have to worry about highway limits. Best of all, it'll pull in and out of any place the trucks can go. Yessir, my MICHIGAN is always ready to go—saves plenty of time too!

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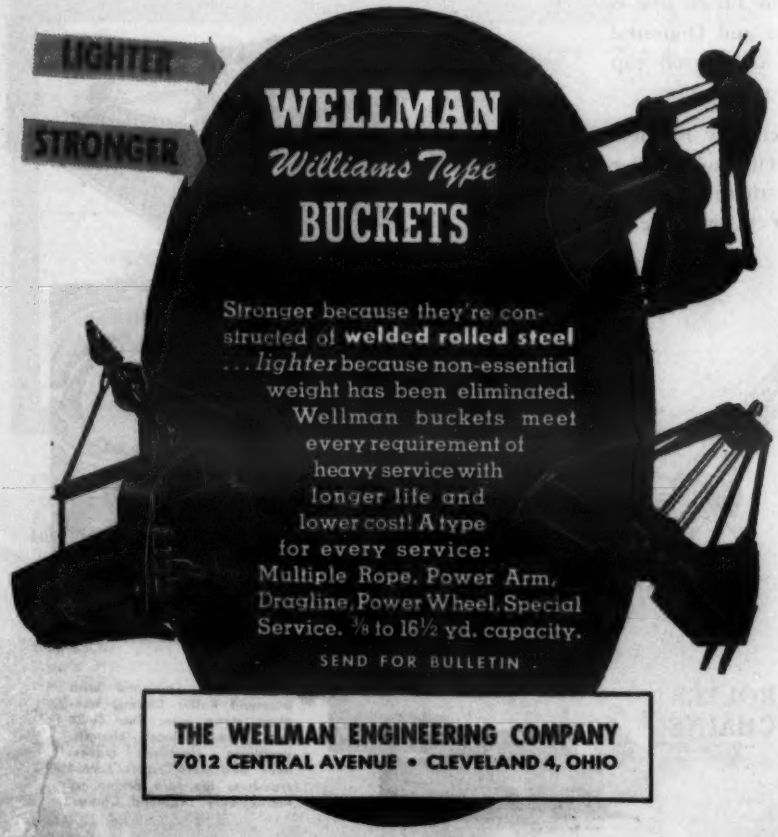
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C. & E. M. Photos
An Etnyre distributor applies RC asphalt to a Utah road between Beaver and Milford (left). Above, chips are spread on by a Buckeye spreader box hooked to the back of a truck.

terial is spread out in a single course to cover the added widening section as well as the old road. It is rolled heavily by an 8-ton tandem steel-wheel roller until the mat is dense and hard. In the past, the surface was then sealed with RC asphalt and an armor coat of chips was put down, but 1948 work was left open for a year as an experiment. After that time it will be given the usual seal coat composed of asphalt and chips.

Seal-Coating Work

Seal-coat work is designed to serve two purposes. First, it livens up the old bituminous surface, which invariably oxidizes and cracks in about 5 years of hot and cold weather. Second, it makes the surface skidproof and improves the light-reflecting characteristics of the road for safer night driving.

The condition of the old surface governs the amount of asphalt seal. Old, cracked, dry surfaces get up to 0.25 gallon of RC-4 per square yard, while a slick, dense surface which is to be skidproofed may get only a 0.15-gallon shot—little more than a light mist.

The asphalt is applied by distributor, usually to half the roadway width at a time. Crushed-rock chips of minus-½-inch size are then trucked in and spread over the asphalt by a Buckeye spreader box on the back of a dump truck. The rate of application for chips is uniform for all bituminous roads; 25 pounds per square yard. These chips are then rolled down to a firm bond with the asphalt by a 1½-ton steel roller pulled by a truck or a rubber-tired tractor.

District 5 has quite an interesting problem in this matter of chips, and nobody has solved it. The district is located in what has been called "Rainbow Canyons". Bryce and Zion National Parks are near by, and the rock through all of this country shows rainbow variations in color. There are red rocks, white rocks, gray rocks, pink rocks, black rocks, purple rocks, and green rocks. The result for chips would be beautiful indeed if all those colors were found in every pit, but unfortunately only one color is usually found in any particular pit. Because the laws of economics are always working against long hauls, a motorist drives over chips of many colors as he passes through the district.

Yearly Maintenance Sequence

Maintenance of highways in District 5 follows a well defined sequence, owing to the distinct seasonal changes of weather from winter temperatures 20 below zero to summer days of 100 degrees.

From January to March, maintenance men are engaged solely in snow-removal work. One rotary Snogo serves the district, and most of the work is done by truck-mounted push plows.

(Continued on next page)

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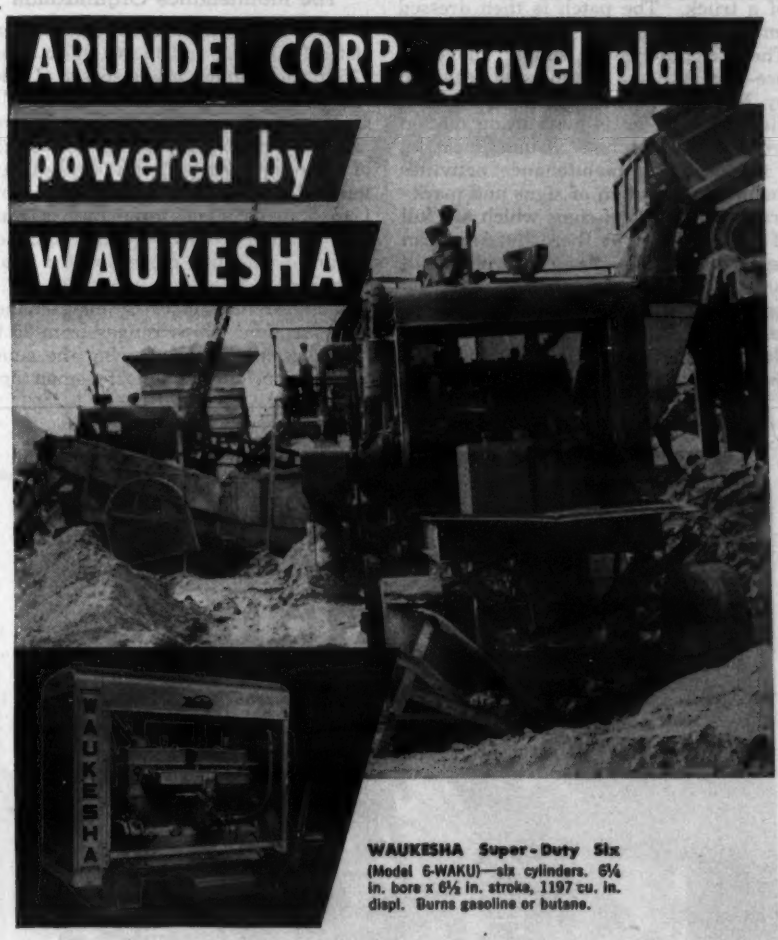
ARUNDEL CORP. gravel plant powered by WAUKESHA



WAUKESHA Super-Duty Six (Model 6-WAKU)—six cylinders. 6¼ in. bore x 6½ in. stroke, 1197 cu. in. displ. Burns gasoline or butane.

● This is one of the Arundel Corporation's sand and gravel plants, near Washington, D. C. Its Pioneer equipment is Waukesha powered for more tonnage . . . faster . . . at low power cost per ton. And for trouble-free operation. That's how to turn out tonnage profitably.

The two power units in this picture are Waukesha Super-Duty Sixes (Model WAKU). That's the tough-to-take-it type—protected against dust and dirt—and rugged all the way, from oil pan to head. Most modern . . . in construction . . . in design . . . for most power per cubic inch displacement. It puts out 225 hp. at 1600 r.p.m. Easily! Eagerly! Efficiently!

Economical to operate. And easily serviced. An overhead valve engine—you just remove the heads and grind the valves wherever it's convenient. Each cylinder is a wet sleeve casting, easily removed from the main case and renewed. Tell you more? All right, send for Bulletin 1139.

Waukesha Motor Company, Waukesha, Wis.
NEW YORK • TULSA • LOS ANGELES

WAUKESHA POWER UNITS

District Crews Whip Highway Maintenance

(*Continued from preceding page*)

A gang system of snow removal is employed, and men sometimes work 24 hours at a time during bad storms.

With the warmer, sunny days of spring there comes a flurry of maintenance activity, as men spread out over the highway system and patch the potholes in the bituminous pavement. Patch material, made of aggregate and SC-3 asphalt during the previous autumn, is always stored in stockpiles over the district.

Better patching than ever before has been started, primarily through the efforts of Roy W. McLeese, Utah's competent hard-driving Chief Engineer. The potholes are opened up to a square or rectangular shape. The mushy subgrade is removed and the hole is backfilled with gravel. A tack coat of asphalt emulsion is then broomed on, and the pre-mix patch material is applied and rolled in with the rear wheels of a truck. The patch is then dressed until it is absolutely smooth and true. The old practice of simply shoveling pre-mix into the potholes is regarded by McLeese as false economy, and to discourage it, he is even using motion pictures as a means of visual education.

Other spring maintenance activities include preparation of signs and markers, replacement of signs which are full of bullet holes put there by American "sportsmen", shoulder grading to fill material back in to the edge of the pavement, and a careful check of all culverts. If culverts are partially plugged, they are cleaned out well ahead of the spring run-off.

From the first part of May until late October, maintenance men concentrate on the bituminous work previously described. The opening of deer season on October 20 each year usually marks the end of bituminous work, although some years it can be carried on until Thanksgiving in Washington County, where Brigham Young once made his winter home.

After the oiling season, there is usually a short period before snow removal begins. During this autumn season the crews paint traffic stripes, clean up the dry weeds to the right-of-way limits, work the shoulders again, and re-check the culverts. The gravel roads are also bladed to tip-top condition. Push plows are installed on trucks to be ready when snow falls. By the first of December, snow is usually falling in the high country, and snow removal begins.

Miscellaneous activities through the whole year consist of weed control, gravel-road maintenance, and firebreak work where highways run adjacent to dry grain fields.

The Maintenance Organization

The regular maintenance crew consists of 85 men, and increases to about 125 in the summer oiling season. Under Sheridan Fiack, District Engineer at Cedar City, are 17 maintenance foremen, scattered over the district. Each of these foremen has a small headquarters yard and shed, and a crew of from 1 to 5 men. Each foreman has from 1 to 6 dump trucks regularly assigned to him, with push plows for the snow season.

Each foreman controls maintenance in his section, which ranges from 25 to 110 miles in length. During the summer season, the various foremen and their men are grouped in gangs to travel over the entire district on oiling work. This practice is rapidly bringing to them a broader concept of highway maintenance than would be likely if they stayed in their own small bailiwicks.

(*Concluded on next page*)

30* CU. YD-HR
PORTABLE CONCRETE PLANT

Write for Data

CAPACITY OF PLANT
Up to 30 cu. yd/hr depending on mixing time.

CAPACITY OF MIXER
Full 3/4 cu. yd. with 10% surcharge capacity.

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20 Cu. Yd. heaped 3 equal compartments.

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All Mixer Bin and AggreMeter Gates hydraulically operated with control levers banked at operator's position.

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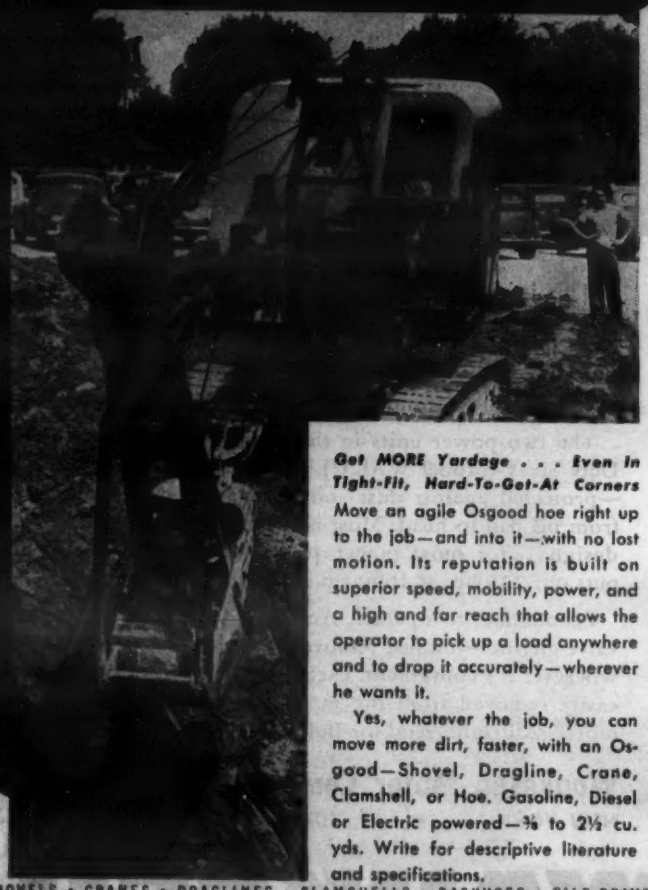

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Move an agile Osgood hoe right up to the job—and into it—with no lost motion. Its reputation is built on superior speed, mobility, power, and a high and far reach that allows the operator to pick up a load anywhere and to drop it accurately—wherever he wants it.

Yes, whatever the job, you can move more dirt, faster, with an Osgood—Shovel, Dragline, Crane, Clamshell, or Hoe. Gasoline, Diesel or Electric powered—⅜ to 2½ cu. yds. Write for descriptive literature and specifications.

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BITUCOTE OFFERS DOUBLE SAFETY — NO HEATING and IT'S NON-VOLATILE

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Bitucote Emulsified Asphalt is not alone labor-saving, it's *labor-aiding*—and *SAFE* TOO.

Applied without heat and mixed with local aggregates, Bitucote provides a hard but ductile, non-skid pavement at low cost.

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U. S. SECURITY BONDS are a good investment BUY THEM REGULARLY

There are 15 motor graders in the district, and these machines are shifted around to the various foremen as the need arises. The District also has a P&H ⅜-yard shovel, 3 tractor-mounted front-end loaders, and 2 bucket-type loaders, which are shifted around the same way. Major repairs to this equipment are made at the main shop at Cedar City, where repair tools and parts for heavy equipment are located.

The maintenance organization of District 5 is frankly political, but this is not to say that some of its key spots have not been filled with good men.

The political rules which govern the selection of permanent maintenance employees are quite clear. When a man is needed, under the present set-up, Watson Adams, a district maintenance supervisor under Mr. Fiack, notifies the local Democratic committeeman. The committeeman then furnishes the names of three men who are loyal to the administration or who control voting strength. Fiack and the maintenance foremen then interview the three men, and choose the one whose experience and attitude is best suited to the road-building business.

Each spring, the District Engineer at Cedar City furnishes to the State's Purchasing Agent an estimate of requirements on asphalt and other major items. Bids are then secured, and the items are delivered at various points in the district. Fiack has full authority to purchase emergency repair items locally.

Despite the handicap of politics, Fiack is slowly boosting the mileage of bituminous reconstruction each season, and several new construction projects have also been let by contract recently. As new ways of boosting efficiency are discovered, they are adopted.

And a strange thing is happening to many of the men who came out to pick political plums. After a short time, asphalt gets into their blood. There comes a natural transformation, a change from the straight politician. Many of the men can now hold up their heads and call themselves road builders.

Front-End Loaders

A new model of the tractor-mounted front-end Shoveloader has been brought out by Lull Mfg. Co., 3612 E. 44th St., Minneapolis 6, Minn. The Model 3-A Shoveloader has a maximum lifting capacity of 1,800 pounds, the manufacturer says, and can be equipped

Automatic scooping action, split-second or slow dump, and load-balance mark the new Model 3-A Shoveloader.

with a ⅜-cubic-yard material bucket or a ¾ to 1-cubic-yard snow bucket.

Among the features claimed for the Model 3-A are its automatic scooping action, split-second or slow dump, and a special design which keeps the load in balance and free from spillage after the bucket is filled. The Model 3-A is designed for mounting on a Case VAI tractor.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 89.

New Gearless Pumps

A portable pump powered by a 1½-hp gasoline engine is announced by the Eco Engineering Co., 12 New York Ave., Newark 1, N. J. The Model PP-2 requires no lubrication, is gearless, and can be run in either direction, the company explains.

The Eco pump has a capacity of 2 to 15 gpm, can be used against pressures up to 100 psi, and is available in four sizes—¼, ⅜, ½, and ¾ inch. It operates at speeds of 200 to 3,400 rpm and can be either belt or chain-driven. The Eco pump is 18 x 18 x 15 inches in size and weighs 51 pounds.

Its body is manufactured from stainless-steel castings or bronze forgings.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 27.

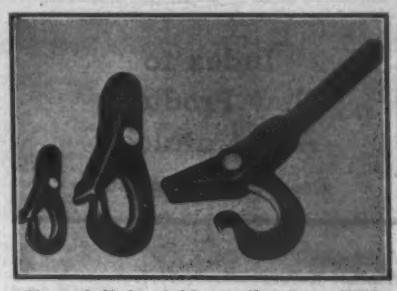
Syntron Announces Changes

Several changes are announced by the Syntron Co., manufacturer of vibratory material-handling equipment and power tools. The Philadelphia branch sales office has moved to 1018 W. Lehigh Ave. The Kansas City, Mo., office has moved to the Wirthman Bldg., 31st at Troost Ave.

John C. Mitchell takes over power-tool sales in the Boston, Mass., office, and F. J. Kirby, Jr., takes over power-tool sales in the Cleveland, Ohio, area. A. C. Staley, Jr., and E. J. McIlvaine are appointed Junior Salesmen in the Vibratory Material Handling Divisions of the Cleveland office and the St. Louis office, respectively. Finally, George L. Chedsey is named Supervisor to direct the engineering design and application of Syntron dewatering screens, vibratory feeders, conveyors, grizzlies, and other equipment.

Feature of Hook Is Its Mousing Action

A new safety hook is announced by The Brewer-Titchener Corp., Cortland, N. Y. It features an automatic mousing action with a safety-tie lip lock designed to hold the point of the hook and prevent the sling from slipping off. The safety-tie mousing engages automatically as the load is applied and disengages when the load is released.



From left to right are the 5-ton BTC safety hook with eye bridge, the 10-ton safety hook with eye bridge, and the 10-ton safety hook with shank bridge.

The BTC safety hooks are drop-forged and all bearing surfaces are machined for accuracy. According to the manufacturer, the pin can be sheared off without affecting the load-holding capacity of the hook. The BTC hook is made in two sizes with capacities of 5 and 10 tons.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 94.

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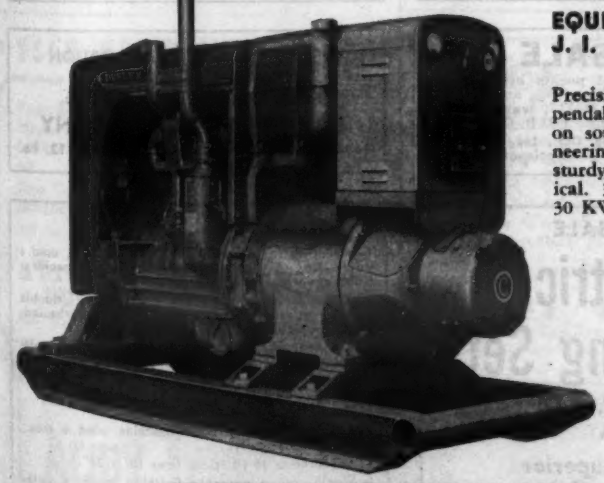
DUPLEX ENGINE GENERATORS



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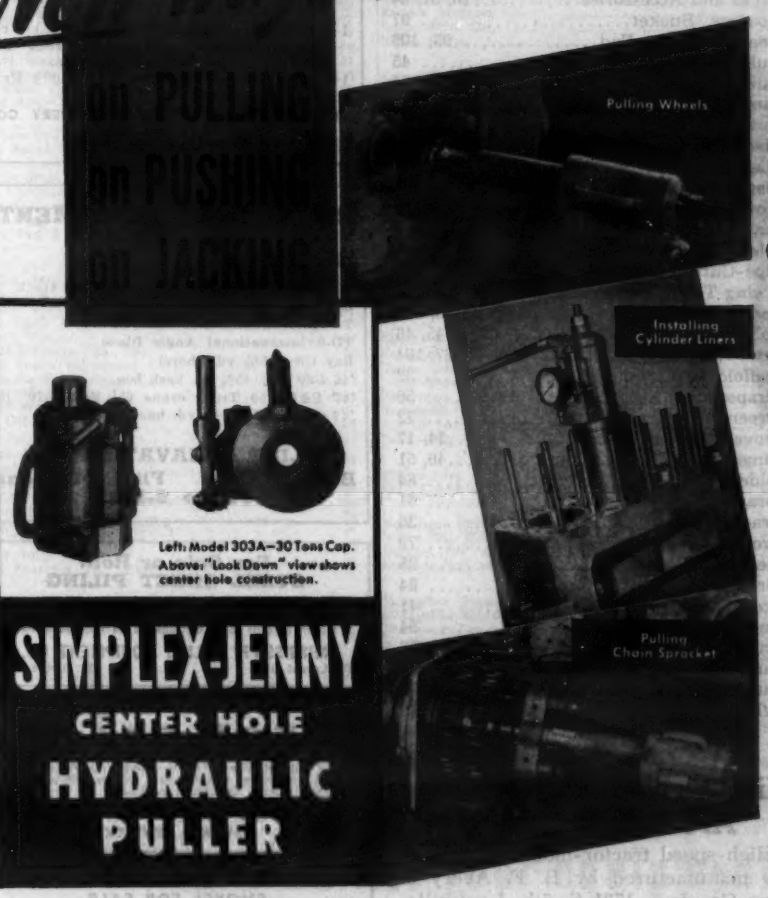

Left: Model 303A—30 Tons Cap. Above: "Look Down" view shows center hole construction.

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CENTER HOLE
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PULLER

Here's the *modern* tool for easily and quickly pulling or pushing wheels, gears, cylinder liners, valves, bushings and similar tough jobs. The versatile Simplex-Jenny, with its exclusive center-hole principle, brings direct-line hydraulic power into play; eliminates the torque action of old-fashioned screw type pullers. You save time and money doing scores of pulling and pushing jobs easily and *safely* in minutes *(yes minutes!)* instead of hours. Simplex-Jenny is portable and compact; five models with 30 to 100 ton capacities.

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